



HEALTHCARE FACILITIES

IHEA National Conference 2023

The National Event for Healthcare Facility Management & Design Professionals

29 - 31 MAY 2023 | ADELAIDE CONVENTION CENTRE

SEE DETAILS ON PAGES 22-27



FEATURED INSIDE

EVALUATION OF COMPETING AIR CLEANING TECHNOLOGIES

THE DEMAND FOR EV - DAY TIME CHARGING IS SMARTER CHARGING

CHALLENGES FOR WOMEN IN HEALTHCARE ENGINEERING



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To support members and industry stakeholders to achieve best practice health engineering in sustainable public and private healthcare sectors.

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EDITOR'S MESSAGE



As editor of this excellent technical journal, I am particularly excited to share this Autumn 2023 edition with readers. This being the pre-conference edition, which is obvious from the cover image of the Adelaide Convention Centre, where the National Conference will be held in just 6 weeks' time, it includes details of keynote speakers and a detailed program outline.

Please take a careful look at the pages dedicated to the conference and check-out the high-quality speakers and technical presentations that have been lined up across the event. With a focus on Risk, Resilience and Relationships the key-note addresses will provide stimulating and educational stories and advice with something for everyone. The technical papers will give you tips and support on how to improve **risk** management, build **resilience** and strengthen **relationships** – all of which are essential in our healthcare engineering environment.

In Branch reports from across the country there are ten pages of news and recent events with some excellent reports on activities held since the last publication. A huge thanks to the state branch committees who have clearly worked hard to bring members together in a collegiate learning experience with some well-known and respected leaders in healthcare engineering solutions. And thanks to those who have contributed their reports and captured the events with photos and provided great ideas for other branches to consider.

As a well-respected member of the International Federation of Healthcare Engineering, IHEA is proud to share some excellent content previously published in the IFHE

Digest. On P63, Daniela Pedrini, Past-President of IFHE, who visited the IHEA Conference in Queensland in 2018, shares a well-developed article that considers the inclusion of more women in healthcare engineering, which has long been a male dominated environment. We hope that IHEA members can support these ideas and encourage improved gender balance in this sector.

Post-disaster facility management is not something any of us really want to think about, however there are lessons to be learnt from those who have been in that situation. Such is the case from the article that explores the learning from Japan after the Great East earthquake of 2011, and with greater expectations on post-disaster recovery in design and operation, the article on P73 is worthy of your attention.

For readers with a more technical focus, the use of SCADA and Internet of Medical Things (IoMT) is explored in an article from the University of Johannesburg that considers infrastructure management in a hospital setting. So once again *Healthcare Facilities* has delivered something for everybody. Please enjoy!

In closing, thank you again to all our stakeholders, advertisers and corporate members who have contributed to this edition. Please take a look at the technical content herein and support the companies that are supporting IHEA to *enable world-class healthcare engineering!*

Regards
Darryl Pitcher – Editor



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NATIONAL PRESIDENT'S MESSAGE



As we move into 2023, it's great to see in this edition of *Healthcare Facilities*, reports from around the country of some excellent end-of-year events that allowed members to get together prior to Christmas and share the networking opportunities that come with membership of IHEA.

The next big networking event is now only 6 weeks away, and the 2023 IHEA National Conference looms large on the near horizon. Vendors are lining up to exhibit their wares, and to showcase emerging and well-established technology to delegates, and the program that is shared in this edition is well rounded and offers a number of good topics. Adelaide in May can be a beautiful city to enjoy, and the conference activities kick off on Sunday with an IHEA members-only social networking evening to catch up with colleagues from across Australia and New Zealand. We look forward to welcoming delegates from NZIHE to share their experience and company with us.

Following a national Board meeting on Monday morning, technical tours will take in several new and recent projects in Adelaide's health-care precinct, close by the Conference venue, which will be followed by the trade show networking with exhibitors and sponsors. The committee have decided to run concurrent sessions on both Tuesday and Wednesday morning, due to the high volume of quality technical papers on offer, and

following the formal opening, fantastic key-note speakers on both days will give the audience plenty to think about.

The SA/NT branch looks forward to welcoming you all to Adelaide, and you are encouraged to register quickly whilst the 'early-bird' offer remains open. There are still some spaces open for exhibitors and sponsorship opportunities. The conference will wrap up late afternoon on Wednesday allowing delegates to travel home if they wish, or better still take a couple of annual leave days and enjoy the beautiful Barossa Valley or magnificent McLaren Vale wine regions. Don't feel the need to rush home! We also encourage delegates to consider exploring other healthcare engineering related activities and visiting colleagues at facilities across Adelaide.

Whatever you do, don't make the mistake of missing out on the best healthcare engineering event in Australia in 2023. Come along and reconnect with and learn from your peers and share your enthusiasm for the excellent work you all do in making a difference in the lives of Australians.

All the best
Darryl Pitcher,
IHEA National President

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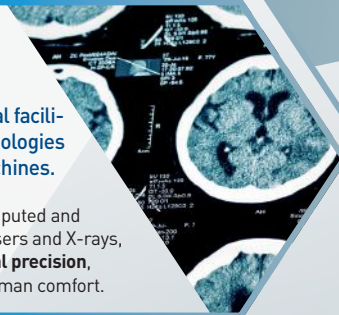
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QUEENSLAND BRANCH REPORT

I hope everybody had a joyful Christmas and a safe new year and spent quality time with family and friends. I am sure for many of us, these holidays seem like distant memories as we ramp up for the year.

Professional Development Seminars

The PD on the afternoon of Thursday 24 November and the Christmas breakup that followed were a great success. Special thanks for our colleagues from Schneider for presenting on *Electric Vehicle Charging and Elegant Single Line Diagrams* and Holyoake for presenting on *Air Management Solutions*. Apologies to Schneider for promoting their topic as “inelegant” single line drawings – in reality very “elegant”! Thanks also to both companies for sponsoring the event.

As we prepare this journal the QLD branch is gearing up for a PD session on the 23rd of March. Our colleagues from CompAir Ingersoll-Rand are sponsoring the event and will be sharing updates about AS2896 – *Changes from 2011 to 2021, Compressed Air and Medical Suction Design*. It is great to see Jason Ward coming back to being involved in providing services to the healthcare sector.



Schneider (L to R): Peter Jessup – Business Development Manager for eMobility and Satendra Deo – Consultative Sales Lead for Field Services



Holyoake: Glendon Raisbeck – Sales Engineer

Mid Year Conference

Peter White and the rest of the sub-committee are busy preparing for the Mid Year Conference that is planned for 20 July 2023. We will keep you posted on details and this year the theme is *SUSTAINABILITY: What, When and Where*. Special thanks to Peter for continuing to be involved for so many years after retirement – there is a rumour though that he is going to make good on his threats and properly retire at some point.

Committee of Management

Brett Nickels is about to commence his grand journey around our great land as he starts his retirement. His contribution to IHEA has been significant with him serving on both the National Board and Queensland Committee (as President and Secretary), and has been active supporter of IHEA for many years. We wish him all the best in his journeys and retirement and hope to entice him back when he gets bored – he will be greatly missed both in IHEA and in Queensland Health.

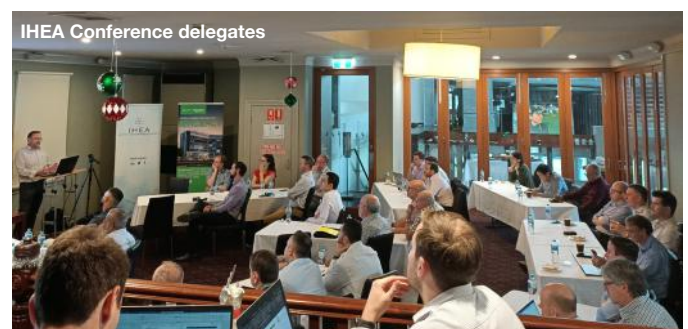
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If you would like to communicate with the QLD Branch via email, please do so at ihea.qld@ihea.org.au.

Wishing you a drama free Autumn.

Danny Tincknell

President, QLD Branch



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VIC/TAS BRANCH NEWS

As life returns to COVID-normal, the Vic-Tas branch will be continuing the monthly lunchtime professional development education sessions in 2023, utilising IHEA sponsors and supporters to present.

All IHEA members are welcome to attend, and information will be provided through the monthly IHEA CONNECTION emails.

These professional development sessions are recorded and made available via the IHEA Connect app and the IHEA website for members who cannot join in at the live event.

We will also look for opportunities for site visits for members.

As part of the Vic-Tas branch news, I would like to share two things with my fellow IHEA members.

Firstly, as a member who is approaching my mid-fifties I have often heard that we should be careful around ladders but suffered from the young mind in an old body syndrome. Unfortunately, this manifested itself in me being injured in a fall from a ladder from only the second rung.

As can be seen from the x-ray the injury was disproportionate to the incident in a younger person but for a

person in their fifties this apparently is to be expected and has resulted in four months of discomfort so far.

I would like to take this opportunity to share some basic ladder safety principles with my fellow members and to remind us all that we don't bounce like we used to.

"Ladder safety is an important issue in Australia, as ladder-related accidents can result in serious injuries or even fatalities. Here are some key points to keep in mind when using ladders in Australia:

1. **Choose the right ladder:** Select a ladder that is appropriate for the job you need to do. Factors to consider include the height you need to reach, the weight capacity required, and the type of surface you will be working on.
2. **Check the ladder before use:** Before using a ladder, inspect it for any defects or damage. Make sure all components are in good working order, and that the ladder is stable and secure.



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3. **Set up the ladder correctly:** Always set up the ladder on a stable and level surface. Ensure that the ladder is placed at the correct angle, with the bottom of the ladder one quarter of its working length away from the wall or structure.
 4. **Climb the ladder safely:** When climbing the ladder, always face the ladder and keep your body centered between the rails. Use both hands to grip the ladder rungs, and never carry heavy items up the ladder.
 5. **Use the ladder safely:** When working on the ladder, avoid overreaching, and never stand on the top three rungs. Always maintain three points of contact with the ladder at all times, either two feet and one hand, or two hands and one foot.
 6. **Work with a partner:** Consider working with a partner when using a ladder, especially for jobs that require heavy lifting or awkward positioning.
 7. **Follow workplace health and safety guidelines:** Ensure that you follow any specific workplace health and safety guidelines related to ladder use, and seek training or advice if you are unsure about how to use a ladder safely.
- By following these guidelines, you can help prevent ladder-related accidents and ensure a safe working environment in Australia."

Secondly, we have all heard a lot about artificial intelligence but I got the opportunity to play with Chat GPT recently. I can honestly say that this was as much of a revelation to me as when I was first exposed to e-mails. The power of this system and the technologies being developed is difficult to explain unless you have had first-hand experience. The best example of this that I can share is that Chat GPT wrote the ladder safety section above in inverted commas after I typed in "Tell me about safety on ladders in Australia" and it took less than a minute!

We are not only living in changing times but in times when the pace of change is accelerating. The task of not only keeping up but also innovating in such a dynamic environment while travelling in a body that does not bounce anymore is becoming more challenging.

Before you ask ... Yes, I did ask the A.I. what next week's lotto numbers will be, but it told me not to tell anybody else.

Steve Ball

Vic-Tas Branch Committee



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SA/NT BRANCH REPORT

Our SA/NT committee is excited to welcome the national membership to Adelaide this May for the National Conference with the overall theme being Risk, Resilience, Relationships.

The Committee has put together a great program for the 2023 National Conference which I am sure you have all seen in the Conference event marketing emails and is included later in this edition for your interest. The SA-NT team is looking forward to welcoming you to our great city in May, to share technical presentations, exciting hospital and healthcare tech-tours, some great social networking opportunities, and the ideal time to explore Adelaide for a few days.

All IHEA members and healthcare engineering professionals are encouraged to join in with this event, to meet the industry providers who will pack the exhibition space, to see new technology and hear from some inspirational key-note speakers. This year the conference will kick off with a “members only” social event on Sunday evening to facilitate re-connection in a friendly and relaxed atmosphere, before we share each other’s company through the conference program and exhibition.

The state committee is optimistic that with a National Conference made successful by your attendance in

Adelaide, together with the opportunity to open the exhibition to healthcare engineering trades people, that we will see an increase in interest in IHEA in our state. We are looking to implement strategies and professional value to potential and lapsed members in the healthcare sector and with the proposed health infrastructure investment coming over the horizon, the timing of an Adelaide National Conference could not be better. We encourage all South Australian readers to engage with the IHEA as members. Good things are coming...

Upcoming events

The SA Branch is holding a PD event on the on the 20th of April on the topic of “*Environmental Social Governance*”. Our speakers for the event are Di Mantell CEO of Celsus Royal Adelaide Hospital. Damian Breen of Celsus Royal Adelaide Hospital. More details to come soon on Eventbrite.

If you wish to communicate directly with the SA/NT branch please email me at ihea.sa@ihea.org.au.

Andrew Russell

President, SA/NT branch



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NSW/ACT BRANCH NEWS

The NSW/ACT branch will be having their first conference in a while, “Down in the Shire” at the Tradies GyMEA, on the 4th-5th May 2023.

The Theme will be “*Curb the Risk, Risk informed infrastructure and systems*” and will be an excellent pre-cursor to the IHEA National Conference later in May to a similar theme.

As it has been a bit of a wild ride over the last few years for everybody in the healthcare industry and beyond, we are going to be focusing on situations that people faced during the pandemic, and on different ideas, products and solutions to address these.

We have fantastic sponsors who will be speaking about their products and services that were invaluable to helping the industry out. In addition, we are fortunate to have Jeff Stark from AviPro to discuss the safety requirements of hospital heliports, and to explore the requirements of establishing a temporary landing site in an emergency situation.

Another discussion we will be having is what to do if you lose your permanent power supply and what processes do you need to put in place to keep the lights on. Always an exciting moment for all involved so we will be talking about

who are the right people to call on and what equipment you will need.

We hope that you come along with plenty of questions, situations or solutions and we can have an open discussion and also a catch up and networking opportunity with your industry colleagues.

If you would like to come along please send me an email ihea.nswact@ihea.org.au

“Is the electric car bad for your health?”.

...I believe so and the more electric cars on the street the worse it is for your health. Sounds controversial in the present context, so just hear me out – the indirect impact is significant.

A good part of my work is organising power supplies to medical imaging equipment in all parts of Australia and New Zealand. Normally power supplies of 100 amps or greater are required, so there are often issues getting the capacity, especially in private hospitals, clinics and commercial buildings.

In one example, we were asked to get capacity to add a new PET CT to an existing practice, so we did the necessary

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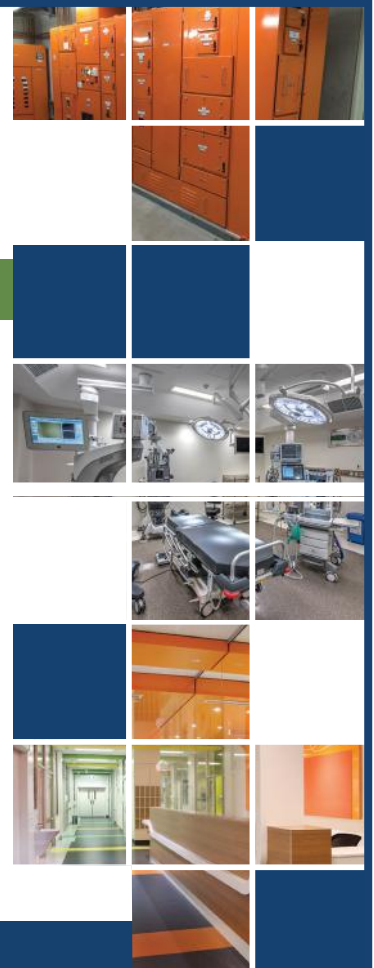
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BRANCH REPORTS

maximum demand calculations for the facility, including, lighting, GPOs, mechanical services, hot water plus the imaging equipment and potential future equipment. We often find we require more than 100 amps, which in most cases commercial tenancy in hospitals or commercial building do not supply.

So, we proceed to complete an application for connection to the energy provider and pay the application fee of \$500, to determine if this is possible. In this case we received an answer back within 2 weeks. In some cases, the application response could take months and the fee could be in the thousands - depending on the energy provider.

We received approval so we started work to upgrade the main switch board for new CT metering and new circuit breakers for the tenancy. All quotes are in, method of installation, safe work method statements and shut down procedures. Shut down procedures normally take the longest due to multiply tenancies. All in place and paper work submitted to the body corporate.

In the majority of cases, once we have the approval from energy provider, we get the green light and the job is completed. New medical equipment is installed and health care outcomes have been improved.

As of just a few months ago, we have been stopped in our tracks and made to think differently on how to approach

installation of new equipment. We followed all procedures, submitted paper work, paid the application fees and received approval from the energy provider.

We then submitted all paper work and approvals to the Body Corporate ... and hit a snag ... we didn't receive their approval ... because they were planning to install electric car charging stations and were concerned the building didn't have capacity for the PET CT upgrade AND the car charging station. In this situation they do have the right to refuse.

This has happened twice recently and I suspect there is a pattern emerging.

Therefore, two separate pieces of medical imaging equipment didn't get installed due to the emerging loads being applied to the energy grid for electric vehicle charging stations.

I am in favour of electric vehicles, but we also must remember that these units require enormous amounts of power and the existing grid systems are not yet up to the task. Something has to give.

Regards

Cameron Ivers

NSW/ACT IHEA President.

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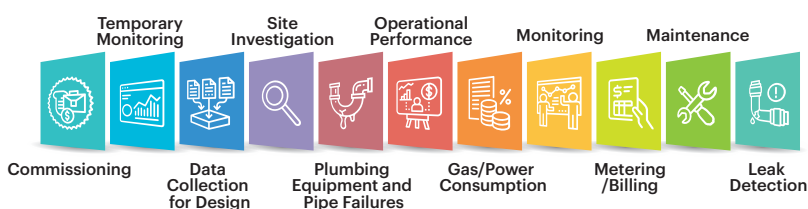
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NSW/ACT BRANCH CONFERENCE INVITATION

RSVP: No later than Thursday, April 27th 2023

**Institute of Healthcare Engineering Australia
NSW / ACT Branch Conference
Thursday 4th & Friday 5th May 2023
Sutherland District Trade Union Club, 57 Manchester Road, Gymea N.S.W.**

The NSW / ACT Branch of the Institute of Healthcare Engineering Australia (IHEA) will be holding a Professional Development Conference, Trades Display and Branch Meeting at the Sutherland District Trade Union Club, Gymea. I cordially invite you and/or representatives of your organisation to take part at this exciting event.

The conference theme ***“Curb the Risk” Risk Informed Infrastructure & Systems*** continues the IHEA principals of providing continuous professional development and exposure to industry best practice, products, technology and practices in the ever-changing face of hospital engineering and healthcare facilities management.

The professional development offered through this invitation is a unique opportunity to increase knowledge of modern industry trends, products and new technology across the broader health care industry. The invitation is extended to IHEA members as well as non-members, engineers, health care facility managers, industry professionals and service providers alike.

Attendees will be a cross section of representatives from metropolitan and country NSW, major public hospitals of the ACT, including both public and private sectors. We are providing a rare opportunity to network with other health care and specialised experts, industry providers and representatives from associated asset, facility and engineering agencies.

The Conference will commence at 11:30 am on Thursday 4th May 2023, with registration, followed by lunch and an afternoon comprising of technical presentations leading into a trade exhibition 16:30 – 18:30. Thursday will conclude after the trade exhibition with a semi-formal dinner. Friday morning will continue with technical presentations and Health Facility tour (to be confirmed).

To attend this year's conference simply contact Mal Allen or Marcus Stalker, Branch Secretary at ihea.nswact@ihea.org.au. We look forward to your attendance and participation at this year's state conference.

Yours Sincerely,

Cameron Ivers

NSW / ACT Branch President

Wallgate 3-in-1 anti-ligature basin with integrated outlet and shelf by Galvin Engineering

Introducing the 3-in-1 Wallgate anti-ligature solid surface basin with integrated shelf, the latest addition to the Wallgate range of healthcare solutions.

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One of the standout features of the new Wallgate basin is its integrated left- or right-hand shelf, which provides a safe and convenient surface for users to place their personal items. Its highly polished finish, anti-microbial properties and seamless manufacturing help to reduce the risk of contamination, as it's

easy to clean and patients and staff will be less likely to place items on the floor or other surfaces where bacteria can thrive.

In addition, the integral outlet of this basin ensures that water flows smoothly and efficiently away from the basin, reducing the risk of blockages and promoting good hygiene practices. This makes the basin an ideal choice for busy healthcare environments, where hygiene and infection control are essential.

Another key feature of this basin is its anti-ligature design, which helps to prevent self-harm and suicide attempts in vulnerable patients. The basin has been carefully designed to ensure that there are no sharp edges or corners that could be used for self-harm, while the robust construction of the basin itself helps to prevent it from being broken and used as a weapon.

The anti-vandal features of this basin are also impressive, with its durable construction providing a long-lasting solution that is highly resistant



to damage and tampering and can be easily resurfaced if scratched or stained. This makes the Wallgate Anti-Ligature Solid Surface Basin with Integrated Shelf a cost-effective investment that will provide reliable service for many years to come.

Overall, the Wallgate basin is a top-of-the-line solution that has been designed specifically for healthcare environments. With its robust construction, anti-ligature and anti-vandal features, and integral outlet, this home-like looking basin provides a safe and hygienic solution that is ideal for use in hospitals, care homes, and other healthcare facilities.

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WA BRANCH REPORT

Hasn't the year slipped by, one minute it was Christmas and now Easter is just around the corner. Not sure if this has anything to do with my age but the years just seem to be flashing past. I have just finished the summer journal submission when I get this email saying the autumn submission deadline is due. Speaking of deadlines, don't you just love them?! I especially love the sound they make as they go whooshing past.

Looking over my shoulder back 5 months to November 2022, I see our members and a few guests meeting at Graylands Hospital to hear Campus Facility Manager Mr Simon Marsh, ably supported by Mr Alex Foster, Director of Fosters Services and Sales Manager, Mr Gary Evans present an overview of electric vehicle operation. They jointly demonstrated the logistics and challenges of owning and operating a fleet of electric vehicles. Special focus was directed to the charging thereof. Alex's technical insight into all aspects of electric vehicle charging was interesting and enlightening. Alex cited case studies where poor planning and foresight can significantly hinder the benefits of electric vehicle ownership. Simon showed us how he manages his fleet by collecting real time data, that he uses to validate the claims of economic and environmental savings over conventional fleet vehicles.

Gary offered insights into the practicalities of driving an electric vehicle on long country trips.

My golden takeaway from the meeting was to ask questions and seek professional advice before purchasing an electric vehicle.

December rolled along very quickly and on December 9th at the Hollywood Subiaco Bowls Club the IHEA Committee hosted the annual Christmas Sundowner. The event was supported by a large number of members, partners and guests. Emceed by Vice President Alex Foster we enjoyed a time networking with old friends and a sumptuous buffet. There was even a trivia competition that proves without doubt, that you do not know as much as you think you do.

Together, our President Jana Simpson and Vice President Alex Foster presented our 2022 annual awards.

Engineer of the Year was awarded to Mr Alex Rodgers of Norman Disney and Young

Alex has demonstrated leadership in managing the team and clients to provide cost-effective solutions to projects within budget and timelines. Alex has been incorporating

sustainability principles in the design for good IAG and energy efficiency thus contributing to low carbon emissions and economies in the health sector. Alex has been actively involved in updating the standards and specifications with the organisations of Tetrattech and NDY offices and providing advice to Hospital engineering works at WA Health Hospitals.



Alex Rodgers

Trades Person of the Year was awarded to Mr Brendan McFaul from Serco Fiona Stanley Hospital.

Brendan is responsible for water quality via daily monitoring and testing and is a member of FSH Infection Control & Prevention & Management Committee. With oversight of water treatment contractors,



Brendan McFaul

Brendan has an enquiring mindset and shows aptitude and willingness to take on new areas of responsibility. He is reliable and trustworthy to complete required duties and in addition will go above and beyond to implement system improvements. Brendan has organised and provides training to colleagues in other water processing equipment (e.g.: Ice Machines and Hot Water Boilers). Has instigated trials of Enware Smartflow taps to reduce legionella risk and water consumption and is actively involved in reduction of water consumption and sustainability initiatives.

Apprentice of the Year was awarded to Mr Josh Biglin from Fosters Services

Josh is an apprentice electrician at Fosters Service and is keen to shoulder responsibility and leads with his tradesperson on hospital and healthcare tasks and can be trusted on the job. Josh has carried out many works so far including HV to fibre optic task across the healthcare sector. He has also taken young and old apprentices under



Josh Biglin



The Fleet



Alex and Gary



Simon Marsh

BRANCH REPORTS

his wing and shows good work ethic, leader in safety doing the work and task correctly the first time. Josh has also won the Foster's apprentice of the quarter award numerous times and is a requested apprentice for work tasking by the trade staff team and is the Apprentice representative on the Fosters Safety committee where he also reviews JSAs and SWMS within the business.

Volunteer of the Year was awarded to Mr Peter Clifford of St John of God Hospital Bunbury

Peter was responsible for organising the Country Conference recently held in Bunbury in 2022. The Conference was well organised and most of the sponsorship that was organised cover the conference expenses. Peter organised the day so smoothly



without any issues. The Conference was a huge success and it was attributed to Peter undertaking a fantastic job.

Santa arrived with a bag full of Christmas goodies and assisted by an Elf, who looked very much like our President, set about distributing presents to all. I was expecting a lot of coal to be handed out, but it seems we Western Australians were good boys and girls during 2022.

The evening ended pretty much as it started with happy conversations from happy people smoothed along by a few drinks.

January is traditionally our quiet month with many members taking time off to enjoy the summer holidays with family and friends. A time of peace and quiet is never a bad thing.

The committee restarted 2023 in February with a visit to the CBD offices of Norman Disney and Young. Members



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BRANCH REPORTS

heard Mr Alex Rodgers recount the legalities, roles and responsibilities of Australian Standard AS1851. AS1851 has been enacted for many years and we all are aware of the content however a gentle reminder of the subtle nuances of the detail never goes astray. Alex's presentation was followed by Mr Brent Marsh and a demonstration and explanation of the importance and value of hydraulic system monitoring. Brent cited case studies where economic savings were missed due to no or poor hydraulic system monitoring. With the assistance of Andrew Pike from Flowgen – Intelligent Plumbing System, we were shown a live WA site system and could see how dynamic data is collected analysed and a resultant action determined. This posed questions regarding opportunities for system analytics software to monitor and analyse real time data.

On March 23rd we are heading into the city again, this time to meet with HFM Asset Management to hear their presentation on Preparing for Net Zero in Healthcare – A Simple



Brent Marsh – Hydraulic Monitoring



President Jana Simpson opening the NDY Meeting



Members listening to Alex's AS1851 Presentation

Guide. This should prove to be an interesting and valuable session and we will share lessons learned in the next Journal.

On May 11th 2023, the IHEA WA members have been invited to attend the Royal Flying Doctors Jandakot Operations Centre. This is a delayed legacy site visit from our National Conference and it will be almost a year since we had to postpone due to the residual effects of the COVID restrictions. I did mention how time flies (pun intended). This is one meeting I will not be missing. The RFDS is truly a remarkable organisation

I encourage all Western Australian members that if it is at all possible, to go to the 2023 National Conference in South Australia on May 29th, 30th and 31st. Registrations are open now.

Kind regards
Frederick Foley
Immediate Past President

An advertisement for ELGi AB series oil-free screw compressors. The image features a large, blue and black industrial compressor unit with 'ELGi' and 'OILFREE' branding. A green, moss-covered path leads from the bottom left towards the compressor. The background is a dark green gradient. In the bottom left corner, there is a QR code and the website 'elgi.com.au'. In the bottom right corner, there is a red banner with the text 'THE CHOICE IS IN YOUR HANDS'. Below the banner, there is a block of text describing the benefits of the AB series compressors.

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IHEA National Conference 2023

The National Event for Healthcare Facility Management & Design Professionals

29 - 31 MAY 2023 | ADELAIDE CONVENTION CENTRE



The Institute of Healthcare Engineering, Australia (IHEA) invites you to register for the 2023 IHEA National Conference.

Proudly hosted by IHEA's South Australian/North Territory Branch in the picturesque City of Adelaide, the Conference will be held from **29 – 31 May** at the **Adelaide Convention Centre**.

Register now at

www.iheaconference.com.au



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Relationships**

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We look forward to meeting you in Adelaide, South Australia in May 2023.

Register now via
www.iheaconference.com.au



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Conference Highlights

Behind-the-scenes technical site tours

Our popular technical tour program will be held on the afternoon of Monday 29 May. Choose from one of the following options, included with all full registrations:

Technical Tour 1 - Adelaide Convention Centre

Technical Tour 2 - Royal Adelaide Hospital

Technical Tour 3 - Women & Children's Hospital

Technical Tour 4 - St Andrew's Hospital

Technical Tour 5 - SAHMRI

Technical Tour 6 - Proton Therapy at Australian Bragg Centre



Register now at www.iheaconference.com.au

f @IHEAUS

Destination

Adelaide has been ranked one of the world's most liveable cities and business delegates have an opportunity to enjoy that while here with those of us fortunate to call this boutique city home. It is a green and spacious city, yet it has large city infrastructure and technology. This means it has everything a delegate would need to access, and all within its easily-walkable boundaries.



The IHEA are excited to be heading back to Adelaide for the first time in 7 years!

The Venue: Adelaide Convention Centre

Fresh from a \$397M redevelopment, the Adelaide Convention Centre (ACC) is one of the world's most modern, flexible and technologically advanced venues. Comprising three distinct yet seamlessly integrated buildings, the Centre spans 20,000sqm of multi-purpose space. In addition to its modern facilities, the Centre is known for its creative menus, expert service and innovative technologies.

DESTINATION PARTNERS



Social Program

IHEA Member Drinks

Date: Sunday 28 May 2023
Location: to be confirmed soon
Time: 5:00PM - 7:00PM
Dress: Smart Casual

A casual IHEA Conference catch up will be held on the evening of Sunday 28 May. Finger food and a beverage on arrival will be provided. Location will be confirmed soon.

Welcome Reception

*Proudly sponsored by
Rhima Australia Pty Ltd*

Date: Monday 29 May 2023
Location: Exhibition Area, Halls N&O,
Adelaide Convention Centre
Time: 5:30PM - 7:30PM
Dress: Smart Casual



Conference Dinner

Date: Tuesday 30 May 2023
Location: The Playford
Time: 6:30PM – 11:00PM
Dress: Cocktail attire

Located in the heart of Adelaide's cultural precinct and a short walk from the Adelaide Convention Centre, The Playford presents a contemporary take on the elegant Art Nouveau era depicted through its unique South Australian art, décor and bespoke customer service.



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Inspirational Keynote Speakers

DR NORMAN SWAN

Host of the Health Report, on ABC Radio National, and Tonic on ABC Television (News24), Dr Norman Swan was born in Scotland, graduated in medicine from the University of Aberdeen and later obtained his postgraduate qualifications in paediatrics.

Norman has won three Walkley National Awards for Australian journalism, including the prestigious Gold, and Australia's top prize for Science Journalism, the Michael Daly Award, twice.



DARREN HICKS

Some of Darren's earliest and fondest memories are of riding bikes. From age 10 to 29 BMX was his chosen discipline and it was a love that never wavered. However, a motor vehicle accident in 2014 changed all of that.

After a hard and at times very dark three months after the accident, Darren rode a bike again for the first time – only this time as an amputee using a prosthetic leg. In April 2015, Darren competed for the first time as a Paraathlete and in 2017 Darren won his first national title. Darren is now a two-time World Champion and held the World Record in the C2 3km Individual Pursuit. His success at the Tokyo Paralympic Games sees him with a Gold and Silver medal to add to his expanding collection of elite medals.



ANNIE HARVEY

Annie Harvey is known for making the complex simple with her practical strategies that you have with you already, even if you don't know it yet.

Annie will join the IHEA Conference to tell you how to beat burnout and raise resilience in ways perhaps we haven't considered.

She has been on a variety of stages including TEDx, Happiness and Its Causes and has recently starred in an Adelaide Fringe show, all about our brain. She has also danced on stage with Richard Branson and she's one of his greatest fans. She is the author of an Amazon #1 Bestseller, The Little Book of STILL and one of her more unusual job titles is a Gelotologist where her clients range from 4 to 94.



CONFERENCE PROGRAM

PRE-CONFERENCE: SUNDAY 28 MAY 2023

5.00pm - 7.00pm	IHEA Member Drinks
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DAY ONE: MONDAY 29 MAY 2023

From 1.30pm	Technical Tours - included in all full registrations
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9.00am - 12.00pm	National Board Meeting
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5.00pm - 7.30pm	Registration Desk Open for Welcome Reception Location: Foyer M, West Building
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5.30pm - 7.30pm	Welcome Reception Location: Halls N&O Dress: Smart Casual Sponsored by Rhima Australia Pty Ltd
-----------------	--

DAY TWO: TUESDAY 30 MAY 2023

7.00am - 5.00pm	Registration Desk Open Location: Foyer M, Adelaide Convention Centre
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All conference sessions will be held in City Rooms, Level 1, Adelaide Convention Centre

8.30am	Official Conference Opening, Welcome to Country & Housekeeping Jess Adamson MC Michael Scerri, IHEA 2023 Conference Convenor Darryl Pitcher, IHEA National President
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9.05am	Gold Sponsor Address - Schneider Electric
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9.15am	KEYNOTE ADDRESS Dr Norman Swan
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10.15am - 10.45am	Morning Tea & Exhibition
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Technical Presentations - 10.45am - 12.05pm

12.05pm	IHEA Annual General Meeting
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12.05pm - 1.30pm	Lunch & Exhibition
------------------	--------------------

Technical Presentations - 1.30pm - 2.10pm

2.10pm	KEYNOTE ADDRESS Annie Harvey
--------	---------------------------------

3.10pm - 3.40pm	Afternoon Tea & Exhibition
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Technical Presentations - 3.40pm - 4.40pm

4.40pm	Conference Sessions Conclude
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6.30pm - 11.00pm	Conference Dinner - The Playford
------------------	----------------------------------

DAY THREE: WEDNESDAY 31 MAY 2023

8.30am - 3.15pm	Registration Desk Open Location: Foyer M, Adelaide Convention Centre
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9.00am	Conference Welcome Day 2 Jess Adamson MC Michael Scerri, IHEA 2023 Conference Convenor
--------	--

9.20am	KEYNOTE ADDRESS Darren Hicks
--------	---------------------------------

10.20am - 10.50am	Morning Tea & Exhibition
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Technical Presentations - 10.50am - 12.10pm

12.10pm - 1.10pm	Lunch & Exhibition
------------------	--------------------

Technical Presentations - 1.10pm - 2.30pm

2.30pm	2024 Conference Presentation, VIC/TAS Branch
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3.00pm	Conference Close & Prize Draws
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This program is an outline only and the organisers reserve the right to change the topics, times and presenters if necessary. For the most up-to-date version of the program, view the conference website www.iheaconference.com.au

Sponsor & exhibitor opportunities are still available!

Sponsoring or exhibiting will provide an excellent opportunity to promote your organisation and to maintain a high profile within the Health Industry. Visit www.iheaconference.com.au to view the available opportunities.

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EVALUATION OF COMPETING AIR CLEANING TECHNOLOGIES

Gregor Riese

Opira Group

Introduction

The air cleaner market has never been more crowded and confusing. What technology works? What doesn't work? What technology produces by-products potentially harmful to human health and what doesn't? How do you go about choosing an air cleaner (also called 'air purifiers') in the face of a multitude of competing claims and laboratory reports paid for by the supplier? Having recently returned from the US Indoor Air Quality Association conference in Austin, Texas, it's clear that the market is going to become more crowded before a clear winning technology emerges. At least a third of the conference exhibitors were showing off novel air cleaning technologies with impressive claims for pathogen removal and clean air delivery.¹ The current explosion of novel air cleaning technologies is not going away soon.

There is strong consensus among leading indoor air experts for the potential of air cleaning technologies to improve the health and wellbeing of occupants in the indoor environment^{2,3,4} but little very guidance on how to evaluate relative performance.

If you wish to compare the performance of air cleaners employing only filters, then the University of Melbourne has an excellent website looking at clean air delivery vs cost to operate vs noise.⁵ This website also advises potential buyers not to use any of the novel air cleaning technologies such as UV sterilisation (UVGI), photocatalytic oxidation (PCO), ionisation and plasma because of the potential health risks and the as-yet independently demonstrated benefits. The WA Department of Health has also released similar advice warning consumers away from novel air cleaning technologies.⁶

This leaves the purchasing manager looking for an air cleaning system with the nigh-impossible task of sorting through the claims and counterclaims of the various air cleaner providers, whether they are portable units or part of the fixed mechanical system. Given that most pathogenic viruses and bacteria are very easily denatured or killed by exposure to clean air and sunlight (these microbes are wimps compared to their much tougher spore/fungi fellow travellers). Therefore, it's certainly likely that most air cleaners are effective in killing a large proportion of viable pathogens after treatment and exposure to the UV, hydroxyl or ozone agents and/or being captured on a filter. What is uncertain are the potential by-products of the air-cleaning process, unintended

or unforeseen indoor air chemistry and the resulting potential long-term health impacts on the human occupants.

This article argues that we should be applying the precautionary principal and await more research on some novel air cleaning technologies before putting them into our hospitals, schools or workplaces. On the other hand, some other mature technologies have been used for decades and their affect on indoor air chemistry are well understood. I attempt to sort through some of the competing claims and look at what the thought leaders in the indoor environment space are telling us.

The case for novel air cleaning technologies – why not play it safe and just stick with filtration?

High Efficiency Particulate Air (HEPA) filters have been around since the late 1940s and are very effective in removing particulates and pathogens from the airstream. The basic HEPA filter is designed to remove up to 99.97% of the most penetrating particulate size of 0.3 μm .⁷ HEPA filters are widely used in hospitals, surgeries, laboratories and the pharmaceutical industry (aseptic manufacturing). Some air quality experts with knowledge of critical environments, argue that HEPA technology is all that is required to achieve aseptic conditions, and that add-on technologies, such as UVGI are not needed.⁸ This opinion ignores the very substantial costs associated with pushing air through a HEPA filter and the associated air pressure loss. These costs have been quantified and shown to provide a diminishing return in terms of infection risks and cost to operate increasingly higher arrestance filters (Figure 1).

In addition to the cost of running filtration-only systems, it is also generally recognised that HEPA filters do not stop all particulates moving through its media and that the most-penetrating particle size (MPPS) of around 0.3 μm coincides

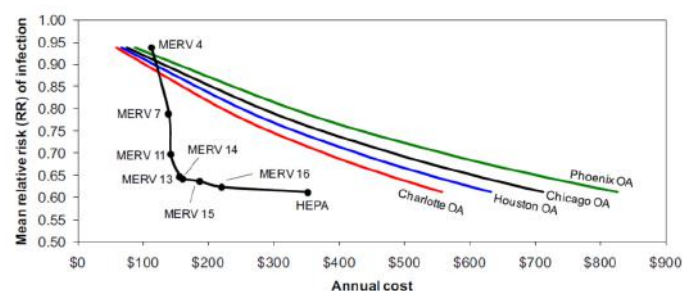


Figure 1 – Filtration effectiveness vs Annual cost to operate.⁹



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with the size of many of the pathogens we are trying to keep out of a critical environment. For example, a recent study of over 1000 hospital patients in the US showed:

- a 90% reduction in airborne pathogen levels
- a 39% reduction in the hospital length of stay
- and a 20% reduction in hospital charges

because of the introduction of a UVGI and carbon filtration system in addition to the existing HEPA filtration.¹⁰ For a more detailed analysis of this study and a review of other independently reported trials using novel air cleaning technology, refer to the article in the Autumn 2022 of Healthcare Facilities.¹¹

The case against novel air cleaning technologies – a primer on indoor air chemistry

For the sake of simplicity, the primary air cleaning technologies addressed in this article are:

- Filtration (HEPA)
- in combination with one or more of the following add-on technologies:
- UVGI (also called a ‘photolytic’ process)
 - Photocatalytic oxidation (generating hydroxyl radical [denoted as *OH])
 - Ionizers/Plasma (charging particulate matter for deposition)
 - Other Fumigation/Fogging methods (open reaction).

The current market offering for these products is far more complicated as air cleaners often do not site neatly within one category and often combine multiple technologies as part of their offering (Figure 2). The most common air cleaner is a HEPA filtration unit, however, these are often combined with UV technology to contribute to the overall kill-rate of any pathogen. More recently, some so called ‘contained reaction’ technologies are generating background levels of the hydroxyl radical equivalent to outdoor air concentrations¹² which is essentially an open reaction/fogging approach but done with occupied indoor spaces. The experience in the US and Canada over the past decade with ozone generators has led to very strong regulatory advisories being issued against fogging ozone in occupied rooms¹³ and it is possible that this prohibition will be extended to other chemicals currently used in occupied indoor spaces.

Ultra Violet Germicidal Irradiation (UVGI)

UVGI light is normally generated by a low-pressure mercury lamp at a wavelength of 254 nm. This light is invisible to humans, but the lamps also emit a weak blue light within the visibility spectrum of the human eye. Extended exposure to UVGI can lead to eye damage (photokeratitis) and reddening of the skin (erythema)¹⁵ so most UV installations are either contained within a confined enclosure or the UV light is shone in the upper room space. The US Centre of Disease Control recommended upper room UVGI for the control of tuberculosis in healthcare facilities¹⁶ and the technology has been used for more than 50 years in indoor spaces.

The dose-response characteristics of UVGI against most pathogens is well understood and the lethal effect of UV radiation is primarily due to the structural defects caused when thymine dimers form in the DNA strand following UV exposure.¹⁷ This can result in the inactivation of the DNA rendering the pathogen unable to reproduce (Figure 3).¹⁸

UV light can interact with UV-active volatile organic compounds (VOCs) already in the air stream to produce a mixture of oxidized by-products and newly formed particulate matter. Upper room UVGI can also photolyze O₃ to produce *OH and break down existing VOCs into other secondary organic aerosols.¹⁹

Photocatalytic oxidation (PCO)

PCO uses a UV light to catalyse the generation of *OH in a confined reaction. The hydroxyl radical is highly reactive to organic molecules (eg smoke, pathogens and other organic contaminants) and can oxidise these into H₂O and CO₂ given sufficient time and exposure (Figure 4).¹⁰ These devices also create an array of unintended by-products depending on the composition of air flowing through the device. Some of these secondary organic aerosols include aldehydes, phosgene, and chlorinated VOCs which can be toxic and/or carcinogenic when breathed in the indoor air.¹⁹

Ionizers/Plasma technologies

Ionizers and plasma technologies target the particulate matter in the air stream and apply an electric charge to the particles to make them ‘stick’ or adhere to interior surfaces, thereby

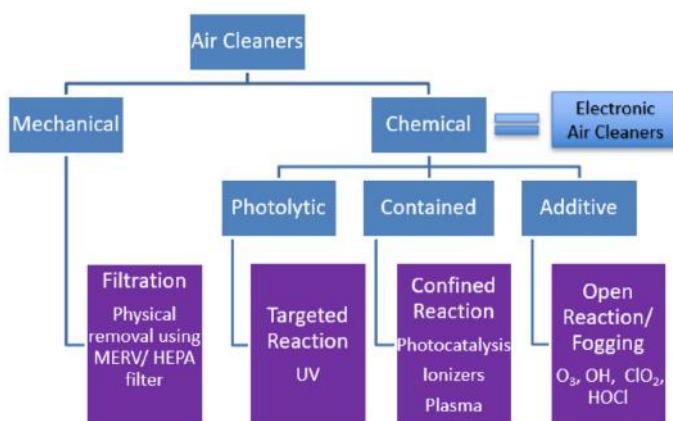


Figure 2 – General classification of the main types of air cleaning technologies¹⁴

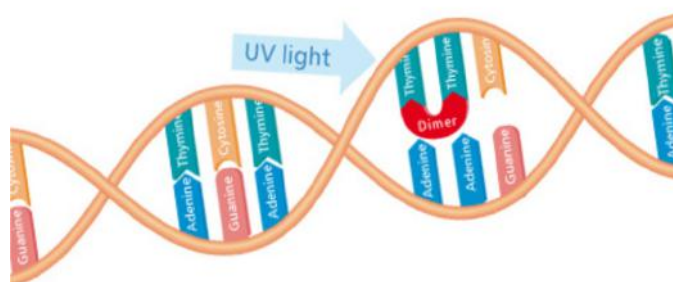


Figure 3 – Mode of action of UV on DNA strand

removing them from the breathing zone (Figure 5).²¹ These particulates can become re-suspended after disturbance and recent research has questioned the effectiveness of particulate matter removal.²² The use of ionisers under laboratory conditions also led to an increase in oxygenated VOCs (e.g., acetone, ethanol) and toluene. Non-thermal plasmas also tended to generate NO_x and O₃, so further treatment of outflow air may be necessary in many instances.¹⁹

Open reaction/fogging

There are a range of highly effective disinfection chemicals used to decontaminate critical environments that involve the exclusion of personnel from that area while treatment occurs (e.g. formaldehyde, chlorine dioxide and vaporised hydrogen peroxide). The use of these chemicals is tightly controlled to ensure that there is no residual gas prior to building occupants re-entering the room. In addition to the US and Canada prohibitions on manufacturers recommending the use of ozone generators as a de-odouriser in occupied spaces, ASHRAE²³ has recommended ozone never be used in occupied spaces and kept as low as reasonably possible.²⁴ Ozone however, can be a highly effective air-cleaning agent if kept as a confined reaction within an air cleaning unit and doesn't reach the occupants breathing zone.²⁵

The air cleaning market has also a large range of air cleaning chemicals which appear on the US Food and Drug Administration's list of substances that are "Generally Recognised as Safe".²⁶ Some of these fumigants or fogging additives, marketed as being 'natural' substances, are potential airborne sensitizers and can contribute to airway inflammation and asthma.²⁷ Similarly, studies of cleaning professionals in hospital indicate that repeated exposure to chlorine-based cleaning products (HOCl and ClO₂) in cleaning solutions can lead to degraded respiratory health.¹⁹ The secondary chemistry resulting from the use of these products can result in oxygenated and chlorinated VOCs of unknown toxicology.

What technologies are the experts and regulators recommending?

The scientific leaders and regulators in the field of

indoor air quality are generally reluctant to make technology endorsements as many of these new technologies have not undergone systematic randomised control trials necessary to show a benefit/no harm in human populations. With one or two notable exceptions involving large scale UVGI studies, most of these air cleaning technologies have only been subject to laboratory trials and the potential for long-term adverse health impacts, particularly around the formation of secondary organic aerosols, are not well understood. In this environment, a degree of caution is advisable both in terms of the health claims, and the potential health downsides.

Table 1 summarises some of the statements or guidance made around differing technologies by industry leading individuals and organisations. The individuals organisations represented in the table are:

- ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) is the peak body for the US heating and ventilation industry sector. The organisation has a strong tradition of producing guidance publications on a diverse range of topics relevant to the HVAC sector.
- Distinguished Professor Lidia Morawska of the Queensland University of Technology and director of the International Laboratory for Air Quality and Health is arguably one of the worlds leading indoor air quality specialists based on her study of aerosol behaviour in the indoor environment. Professor Morawska was one of the handful of scientists who were instrumental in convincing the World Health Organisation that SARS-CoV-2 was an

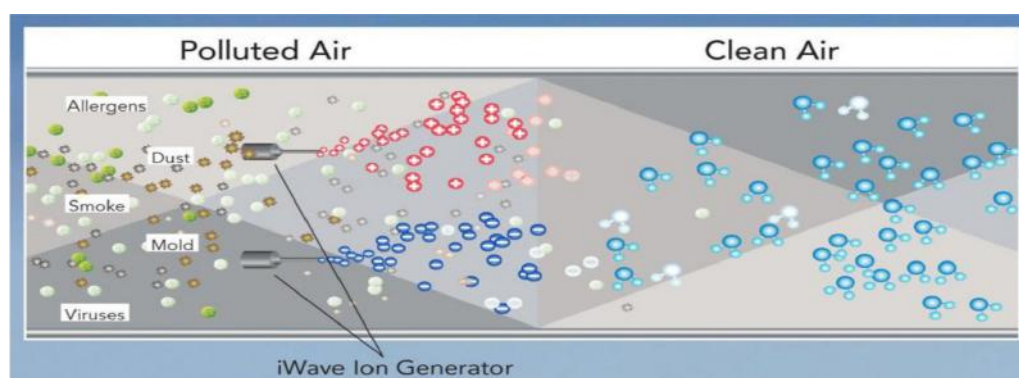


Figure 5 – Mode of action of ionising/plasma generators

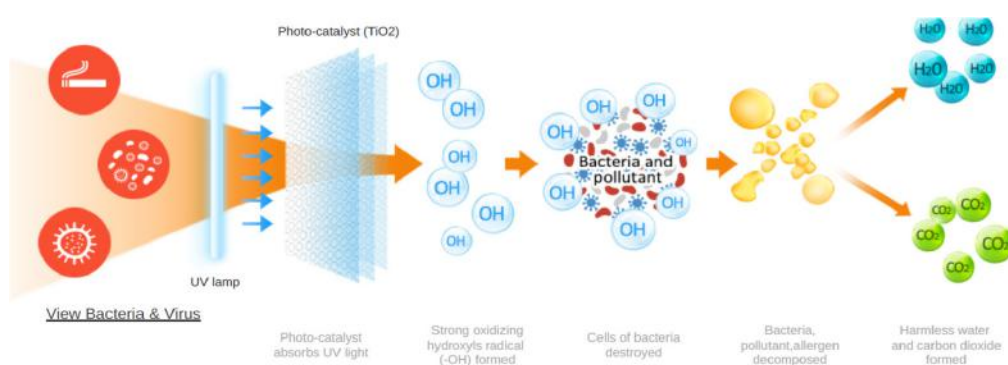


Figure 4 – Mode of action of photo-catalytic oxidation

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	Filtration Physical removal MERV/ HEPA filter	Targeted Reaction UV Sterilisation/ Disinfection	Confined Reaction Photocatalysis Ionizers Plasma	Open Reaction/ Fogging O_3 , OH, ClO_2 , HOCl
ASHRAE 2021 ²⁹		UV Guidance		$O_3 < 10$ PPM
Morawska L. ³⁰				
NIOSH ³¹	-	Upper room	-	-
CARB ³²			$O_3 < 50$ PPM	
Miller SL ³³				

Table 1 – Summary of air cleaning recommendations of key industry leaders and regulatory bodies

airborne virus and spread primarily through aerosols rather than through fomite (surface) contact.²⁸

- NIOSH (The National Institute for Occupational Safety and Health) is part of the US Centre for Disease Control and Prevention (CDC).
- CARB (The California Air Resources Board) is a leading regulator of air cleaning products in the US. Devices which are sold in the US state of California are required to have a CARB registration and be demonstrated to produce ozone concentrations of less than 50 ppb.
- Professor Shelly Miller is a leading US indoor air quality researcher based at the University of Colorado Boulder and was recently a key scientific voice at the White House Summit on Indoor Air Quality.

Beyond mechanical filtration methods of air cleaning, there is a strong consensus that UV sterilization is a mature, effective and safe technology for air cleaning purposes when installed by professional personnel from a reputable supplier. Several other electronic air cleaning technologies show great promise, however there are currently no well-developed standards for evaluating the relative performance of these technologies and their potential chemical emissions when the incoming air contains VOCs or other airborne contaminants. Some recent work on the development of new performance standards for air cleaners by ASHRAE and ISO may change this situation.

A light at the end of the tunnel? Development of a new ISO standard for air cleaner performance

The ISO Technical Committee 142 (cleaning equipment for air and other gases) is in the process of developing a new draft standard for measuring performance of air cleaning appliances. The draft standard is not yet available for public consultation, but key elements of the pre-public release draft give some cause for hope:

- Establishment of a standardized metric expressed as a “clean air delivery rate” (m-CADR) expressed as a m³/hour of air from which microbes have been denatured or removed. The m-CADR metric takes account of the natural decay of microbe concentrations without the air cleaner operating and then when it is operating.
- Specifying suitable microbial species for testing and the chamber configuration/equipment used in performance testing.
- Documenting the operation levels for the technology being tested including concentration of ozone and hydroxyl radical emitted by the device.

ASHRAE is also developing a standard with a similar scope (designated ASHRAE Standard 185.3P), however this standard explicitly excludes the health and safety effects of operating air cleaners in an occupied room.³⁴ Either way, there is reason to hope that we will have some standardised test

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Business Case at a glance.

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Thermal Efficiency	✓	✓
No Chemical Treatment	✗	✓
Low Running Costs	✗	✓
No Registration and Compliance	✗	✓

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methods available soon that will make the job of comparative evaluation of air cleaner performance a much easier task than it currently is.

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Disclosures: Opira is an Australian-based supplier of filtration, UV and fumigation technologies, primarily to the healthcare and pharmaceutical sectors



THE DEMAND FOR EV - DAY TIME CHARGING IS SMARTER CHARGING

Richard Butcher

Velocity Energy

While the growth of electric vehicles (EV) has been slower in Australia compared to other nations, a rapid increase is already underway with the number already doubling since 2020, and no sign of it slowing down.

The pressure that this growth will put on the electric grid makes it necessary for EV owners to utilise dynamic daytime charging systems, with healthcare facilities perfectly placed to contribute to a solution.

Ergon Energy Network and Energex Network embarked on a research program in 2020 to better understand the charging patterns of EV drivers during the innovation phase of the adoption lifecycle to find ways that will mitigate emerging challenges that may come with the future growth.

According to the *EV SmartCharge Queensland Insights Report* it is estimated that there were 31,784 EVs in Australia in 2020, with an incredible 83,000+ on Australian roads just two years later (*Australian Electrical Vehicle Industry Recap 2022*). This report carried out by Electric Vehicle Council found that there were 39,353 EVs purchased in 2022 alone with 3.8 per cent of all new cars purchased being EVs.

Reducing the demand on the grid

The EV SmartCharge research found that EVs have the potential to double the electricity demand of residential properties, adding almost half of the energy consumed in a typical household daily, based on recharging for an average daily commute. Localised parts of the network infrastructure are set to struggle to meet the increasing demand on EV

charging with a higher number of vehicles on the road. This is one reason for a shift from night charging to daytime charging.

Daytime charging allows us to take advantage of under utilised renewable solar and wind generation and a more dynamic tariff, as the diversified daily charging profile is favourable to owners and networks alike.

Convenience charging at home during peak periods in the evenings could have negative impacts on the network and there are higher costs associated with this practice for EV owners.

When analysing the EV SmartCharge report participants, the diversified average of home charging was 0.25kW. However, charging at night on the top 10 network peak days between 4pm and 9pm, tripled the average to 0.75kW.

The EV SmartCharge Report noted that these participants from Southeast Queensland travelled 42.5km per day, 15 per cent more than internal combustion engine vehicles, with a corresponding 9.36kWh in daily consumption. This did not include regenerative charging.

Large battery electric vehicles (BEV) travelled on average 50 per cent more than BEV small vehicles and twice that of plug-in hybrid electric vehicles excluding petrol kms. This demonstrated that battery size and distance travelled are correlated.

FEATURE ARTICLES

Creating incentives for EV owners

Some EV owners may have the flexibility to park at home and charge during times when their solar PV is generating excess energy, however the majority do not. Households who are unable to capture PV energy into their vehicle during the day are more likely to charge their EV at night.

The EV SmartCharge report indicates that there is a common practice for people to convenience charge their EVs at home during the peak times which over time will put more pressure on the electric grid. There needs to be continual investment in EV charging infrastructure, which is something state governments across the country are encouraging.

The Queensland Government allocated \$10 million to co-fund the installation of public fast charging infrastructure, which builds on the Queensland Electric Super Highway, keeping EV drivers connected across the state. This initiative will minimise waiting time for long highway journeys and give confidence to EV owners that they have other charging options outside the home. They also introduced the Zero Emission Vehicle Rebate Scheme available to all new EV purchases in the state of a value up to \$58,000 from mid-2022.

Incentives such as this are fast tracking the Queensland Government's targets for EV ownership which is expected to be 100 per cent of all new vehicles by 2036.

It is up to businesses to look at a smarter solution which involves shifting from night charging to charging in the day as EV cars continue to skyrocket in popularity. As a public service institution, it is imperative to plan ahead to meet the future demand of a resource that will boost employee satisfaction and make your healthcare facility more attractive to doctors, employees and visiting specialists.

As the EV SmartCharge research shows, the majority of EV owners have their vehicles parked at the workplace most of the time, only second to at-home charging. Businesses who offer EV charging stations are giving their staff and visitors an opportunity to top up after the morning commute and fully recharge while the car is not in use, reducing range anxiety and negating the need for high cost installation of at home chargers.

More convenience for EV owners

Owners of EV cars are faced with the initial costs of installing a charging system at home and potentially upgrading their switchboards. Plus, research by Origin Energy has shown the

rapid growth of EV vehicles will increase peak electricity demand by at least 30 per cent if we continue to charge at home overnight.

People who live in apartments and only have street parking, or those who are renting and are unable to install at-home charging stations due to body corporate restrictions will be reliant on public access EV charging - workplace chargers will create an incentive for them. It takes the pressure off body corporates paying for the charging infrastructure and determining who is responsible for paying if only a small amount of residents own EVs.

Practicing Corporate Social Responsibility

There is a significant excess of renewable energy available during the day with consumers and businesses feeding solar energy back to the grid to ensure no energy is wasted. By providing daytime charging at your healthcare facility this is not only an employee incentive, but it demonstrates corporate social responsibility and gives you a chance to exercise your green credentials.

When owners manage their EV charging and take advantage of renewable solar generation the diversified daily charging profile is favourable to everyone.

Many global businesses offer EV charging for their employees and visitors, with some providing it as a free benefit to employees, while others use it to generate additional revenue through user-paid charging.

Specifically for doctors and visiting specialists to your hospital, the convenience of onsite charging will make for an appealing factor when considering where to work or where to set up specialist practices.

The factor of employee incentives plus corporate social responsibility practices will attract and retain good staff and create a positive reputation for your facility.

Medical staff are expected to care for people and by providing EV charging you will also be building on your green credibility and dedication to protecting the environment. This is such a crucial factor when considering building management as being green has become an expectation.





About Flex Charge

Flex Charge is one such business that is working to support a shift in EV charging to take the pressure off the grid at these peak times. The Australian-based service provider of charging solutions for EVs is an all-in-one, reliable and flexible solution for workplace daytime charging in a health care setting.

EV charging infrastructure requires ongoing management to ensure you are optimising consumption so that the charging stations are not demanding more than the current capacity available from the grid. This is a service that Flex Charge can offer.

Flex Charge is part of the Velocity Energy Group and provides flexible and faster level 2 EV Charging units which they install and manage. Flex Charge uses a national EV app for payment and billing, dynamic load management and you can charge anywhere, anytime with Inter-Charge network roaming.

Founder, Richard Butcher, is dedicated to encouraging the shift to daytime charging for EVs to take pressure off the energy network, safeguarding the environment and making EV charging simple and flexible for everyone.

Flex Charge will be looking for interested healthcare businesses to participate in an EV charging trial in the near future.

Workplace Daytime EV Charging Solutions for Health Care Facilities

Flex Charge provides an all-in-one reliable, flexible solution for Workplace Daytime EV charging to help attract and retain health care professionals.

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- National EV Mobile App, Payment & Billing managed by Flex Charge
- Dynamic Load Management for site demand limiting and Time of Use limiting
- Charge anywhere, anytime with Inter-Charge Network Roaming

Health care professionals will value the convenience of charging their electric vehicle using Flex Charge's Workplace Daytime EV Charging Network. The solar soak strategy will demonstrate your commitment to a greener future.

Flex Charge is part of Velocity Energy, which has a proven history as a technology enabler and operator of demand response and virtual power stations.



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- Enveloped viruses
- Fungi & mould
- Pollen
- Animal epithelia
- Odour molecules

Only electricity and ambient air are required for generation. There is no waste material. Our devices generate the cold plasma using our unique and innovative plasma source.

It is believed that cold plasma technology will be the standard in various disciplines where hygiene is fundamental. It is a high-quality, sustainable and uncomplicated healthy technology solution that simplify people's lives. Product development started in 2014 in Germany.

Extreme Convenience

The Cold Plasma disinfection system for air and surfaces sanitization offers maximum cost-effectiveness as no complicated filters have to be replaced. This leads to a maintenance-free device with no follow-up costs.

Four portable devices are available, for community transport, small and large rooms, health care facilities i.e hospitals, clinics and surgical:

- Plasmocar
- Plasmohands
- Plasmair (Pro & Compact)
- Plasmolight

It also offers maximum comfort. The Cold Plasma devices can work automatically and continuously 24/7. Or it can be easily switched on and off, at any time.

Sanitization in real time

The risk of infection is reduced after only half an hour. After that, the device disinfects, in real time and very quietly. Pathogens are directly eliminated from rooms and or transport as soon as someone enters the space and exhales. With any of the devices, the cold plasma is generated and distributed evenly and permanently into the room and on surfaces. The disinfection therefore takes place in real time and immediately.

When we look at different technologies available in the market, the air takes time to be filtered and to be blown out again. It is not immediate.

Award-winning Product – Plasmohand

Giving the high volume of people and places which uses some sort of hand sanitization, here are some facts:

- Dermatologists confirm that alcohol-based disinfectants cause long-term skin damage when used repeatedly.
- Conventional disinfectants generate a lot of plastic waste.
- Large majority of people uses liquid disinfectant incorrectly.
- Classic air purifiers are bulky, loud and maintenance intensive.
- Classic air purifiers do not disinfect in real time because they first suck in the room air and filter it in the device.

On the other hand, the patented plasma-activated aerosol is so effective that it even reaches the areas between the fingers, under the fingernails and the space between jewellery and skin. Unlike alcohols, it does not damage the skin's own flora. The mixture is just as harmless for objects such as mobile phones, keys, credit cards and much more.

The product was awarded 2015 (Shaumburgh) and 2022 German Innovation Award, and in 2021 as the Best Hand Hygiene at Healthy Innovation Awards, Dubai.

Besides electricity and ambient air, PLASMOHAND requires a very small amount of specific process water – about one drop per application. It is atomized into the finest aerosols, whose tiny particles wet the entire hand.

Cold Plasma devices can be used safely in:

- Waiting rooms and clinics
- Ambulances
- Community cars
- Buses and taxis
- High-risk patients
- Operating theatres
- Hospitals
- Offices



When did you last review your contractor management approach?



Contractor Management



Site Management



Induction Management



Visitor Management



Credential Management



Incident and Hazard Reporting



LinkSafe's online contractor management solution offers the healthcare sector two distinct options

- Manage your own contractors and pre-qualify, induct and validate compliance upon entering site.
- Let us pre-qualify your contractors for you and be part of the LinkSafe Health community.

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CONTRACTOR SAFETY MANAGEMENT IN HEALTH – KEEPING YOU AWAKE?

Sue Bottrell

Linksafe

Healthcare providers engage contractors on a daily basis to deliver high quality healthcare services. However the process of hiring and managing contractors from a safety perspective can be confusing and result in various compliance issues for managers, maintenance staff and hospital boards.

Healthcare operators and hospital boards may question what their obligations are as an employer in respect of contractor safety management, what would happen if there is an incident with a contractor on a site they are responsible for, and how they would respond to patients, regulators or the media in the event of an incident.

The healthcare industry is a high stakes game and an incident can result in catastrophic outcomes, including significant impact on patients and a hospital's reputation. However, the misinformation and lack of understanding regarding the requirements under health and safety law in respect of contractor safety management has led to complex and ineffective contractor safety management systems. This includes lengthy and poorly drafted pre qualification processes, the preparation of large amounts of paperwork by both contractors and healthcare providers, disorganised inductions and assurance processes that do little to ensure that contractor safety management is undertaken well.

It would be understandable if employers were under the impression that if there were to be an incident involving an independent contractor at their site, the organisation would be liable under health and safety law and may be liable for damages. For example, if a contractor works at the site and falls from height or injures a patient, surely the hospital would be liable?

To confirm liability, as repeatedly confirmed by Australia Courts, under health and safety legislation and civil law, it applies when a party has control over the matters that led to the incident. In the case of independent skilled contractors, they have (or should have) full control over the safety matters associated with their work, and those who engage them are entitled to rely on them to self-manage those risks.

Hospital staff are not builders, electricians, plumbers, or a myriad of other contractors, and it is not reasonably

practicable to expect hospital staff to understand, manage or oversee the management of safety by those contractors, and it may in fact be illegal to direct a licensed contractor.

However, contractors are still workers and employers do indeed have legal obligations under health and safety law to them, but what are they? An employer's health and safety obligations to contractors extends to ensuring that a contractor is not harmed by the employer's operations and matters over which the employer has control, for example site safety.

Therefore the focus of contractor safety management should be on ensuring that contractor's understand the risks posed to them when working in a healthcare setting to enable them to work safely, such as providing crucial information about biological hazards, restricted areas, radiation hazards etc.

So how do we assure our stakeholders that we have acted with due diligence when hiring contractors, have a process to ensure contractors understand our workplace and the hazards they may face, and finally are clear on what hazards they may introduce through their work can have a devastating impact in our workplace?

Stage 1 — Set up and enforce well-structured engagement and pre qualification processes. This does not mean collecting and reviewing technical safety documentation, but ensuring employers have the right relationship with their contractor. This includes confirming reliance on the contractor as an expert who is relied on to manage safety in respect of their work. Asking the right questions to obtain assurance from contractors that they are in fact managing safety and have provided specific assurance of their safety performance.

Stage 2 — Set up a focused onboarding process to share critical information about your organisation's risk profile and to ensure contractors can plan their work in the context of those risks.

Stage 3 — Confirm contractors have implemented risk controls to manage the risks we have informed them of, for example, isolating work from patients, managing infection control and complying with all site safety instructions and proactively managing critical risks that could harm staff, patients, and visitors.

A targeted contractor management program that efficiently and effectively obtains confirmation of safety management by contractors through thorough prequalification, targeted inductions and focused monitoring will ensure your organisation is equipped to both prevent and respond to any incidents that may involve your contractors. Implementing a reliable, digital contractor management system to administer end-to-end, water-tight contractor safety management processes will ensure that all contractors are qualified, have provided proper assurance of safety management, have been inducted before attending the site or conducting any work, are

confirmed as managing critical risks and are confirmed as being qualified to be on-site at the time of sign-in.

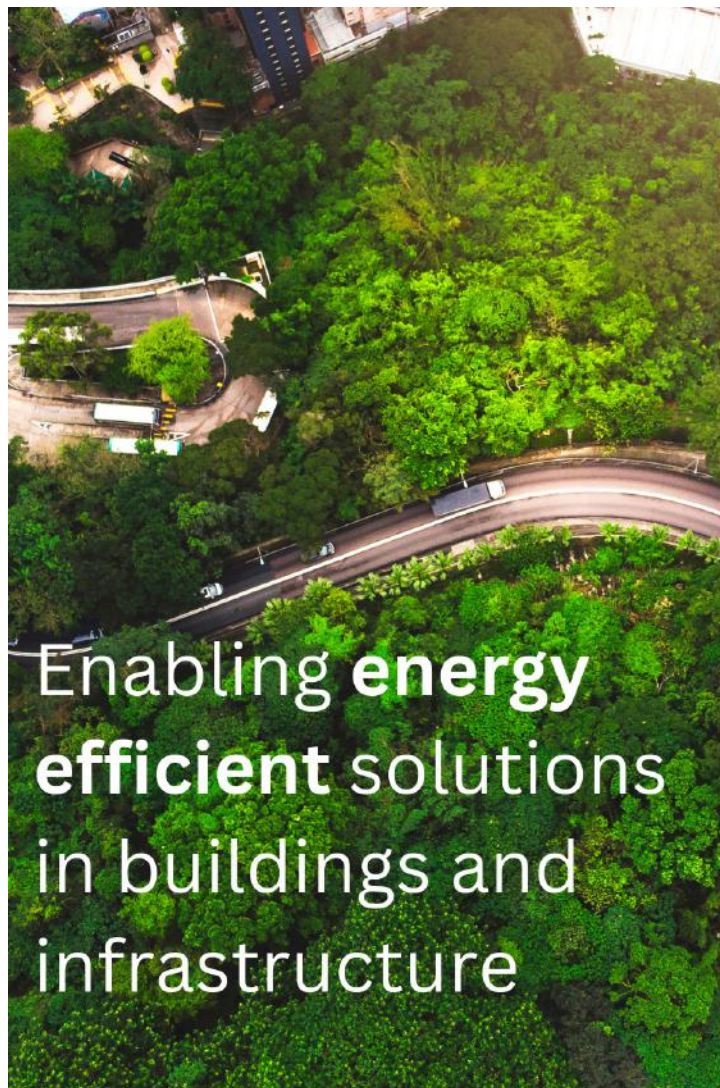
To find out more, visit the LinkSafe website.

About LinkSafe

LinkSafe is a holistic contractor & safety management solution with experience working with small to large businesses Australia-wide. LinkSafe clients are supported with a robust & reliable software platform, legal expertise and advice as well as representation when dealing with regulators, making them the leaders in their field.



Sue Bottrell



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THE INTER-RELATIONSHIP BETWEEN ENERGY MANAGEMENT AND ASSET MANAGEMENT OF HEALTHCARE FACILITIES

David Chokolich

HFM Asset Management Pty Ltd

Managing healthcare facilities requires balancing two significant areas – energy management and asset management. At the heart of it, the two are closely interrelated and cannot be approached as silos. Focussing on either one without paying attention to the other can lead to inefficiencies in building operations, resulting in increased costs, poor patient outcomes and a negative impact on the environment. This article aims to highlight the critical interrelationship between energy management and asset management in healthcare facilities and the importance of taking an integrated approach to maximise operational efficiency.

Energy Management – A Key Aspect of Healthcare Facilities

Healthcare facilities are significant energy consumers, and energy management is essential in ensuring overall sustainability. Heating, ventilation, and air conditioning (HVAC) systems, lighting, medical equipment, and other energy-intensive devices contribute to a significant portion of energy consumption in healthcare facilities. According to the Department of Environment and Energy, hospitals are one of the most intensive energy users in the commercial sector, accounting for around 3% of Australia's greenhouse gas emissions. Therefore, energy efficiency measures can significantly impact the building's environmental footprint and can drastically reduce the overall operational costs.

Asset Management – Key to Protecting Investments and Ensuring Safety

Asset management ensures that healthcare facilities' critical equipment and systems perform efficiently and continue to function optimally over time. Asset management involves regular maintenance, repairs, and asset replacement as needed. Numerous critical systems, including HVAC, electrical, plumbing, and medical equipment, must be continually monitored to ensure they are functioning correctly. A well-functioning asset management program is essential in minimising unexpected equipment failures, reducing life cycle costs, and ensuring building safety. This information is maintained via a Computerised Maintenance Management

System (CMMS) and planning undertaken through Life Cycle Costing Analysis. The Asset Management Plan for the building should summarise these with processes and actions.

The Interrelationship between Energy Management and Asset Management

The interplay between energy management and asset management is vital in healthcare facilities' efficient operation. Understanding the relationship between the two functions can help identify opportunities to maximise building efficiency and reduce costs. The two areas are interrelated in several ways:

1. Maintenance and Energy Use

One of the most significant connections between energy management and asset management is regular maintenance. Regular maintenance of building systems can detect minor issues, such as broken components, low refrigerant levels, and cleaning filters, that can add up and cause energy inefficiencies. Regular maintenance is essential in ensuring that HVAC systems, lighting, and medical equipment runs optimally, reducing energy consumption and reducing equipment downtime.

2. Equipment Selection

Energy-efficient equipment is essential in minimising energy consumption in healthcare facilities. However, energy efficiency should not come at the expense of asset management. Selecting the right equipment and components based on life cycle cost and reliability can not only help reduce energy

consumption but can also minimise maintenance and repair costs. Choosing reliable components, such as motors, drives, and control equipment, can indirectly reduce energy usage by minimising equipment downtime, reducing the load on remaining equipment and maintaining optimal performance.

A healthcare facility which has a well-developed life cycle costing and asset renewal plan is strategically positioned to optimise the integration of energy efficiency into its decision making as there is time to plan, rather than operating reactively.

This is increasingly important as organisations set targets to achieve Net-zero emissions in the medium to long term future.

3. Building Control Systems

Building control systems play a crucial role in energy management in healthcare facilities. Control systems can optimise building energy consumption by controlling heating, ventilation, and cooling automatically. Building control systems also play a critical role in asset management. Control systems can monitor critical equipment performance and detect small issues before they become significant problems. Maintaining the building control system's integrity can prevent costly system failures and improvements to building efficiency.

From an asset management perspective, long term planning enables multiple systems to be considered for integration as they are procured, to improve the energy efficiency of the facility.

4. Energy Consumption and Equipment Life Expectancy

Energy management affects the lifespan of critical equipment in healthcare facilities. Energy consumption can affect the longevity of equipment components, particularly those that are energy-intensive, such as HVAC systems. If equipment is overworked, it can wear down prematurely, reducing the overall lifespan of the asset. Regular maintenance and energy-efficient operations can help extend the lifespan of equipment and protect the investment. Consequently, asset management plays a vital role in extending the life expectancy and reliability of building equipment, reducing long-term costs and improving building sustainability.

Conclusion

In today's healthcare environment and increasingly with the focus on Net-Zero and emissions reductions, balancing energy management and asset management has never been more critical. Taking steps to improve energy efficiency and asset management can significantly impact a facility's overall sustainability.



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THE DIRTY SECRET ABOUT HOSPITAL ENGINEERING...

Ben Gill

Bluebox

Every building engineer within every hospital in Australia is trying to keep their facility clean, safe and efficient. Yet there is one aspect of the air conditioning in a hospital that nobody really likes to talk about; the level of biological matter within the cooling and heating coils. The brutal truth is that over time, coils become clogged with bio-fouling and conventional methods for cleaning them are ineffective. This biofouling leads to reduced heat transfer, equipment working harder, wasted energy, increased operating costs and higher emissions.

The Constraints

Take a moment to think about the constraints of a hospital air-conditioning system.

Hospital operations run 24/7 and require top tier operational resilience. Harsh chemicals need to be avoided. Staff and patients have high comfort expectations. Budgets are consistently under pressure. And like any work place safety is of the utmost importance.

This is all in an external environment where energy costs are accelerating and showing no signs of slowing down.

Why hasn't this been solved?

Firstly conventional coil cleaning requires the unit to be powered down for 2 to 4 hours. But that's not the real issue; hence our dirty little secret...

The real issue is that the biofouling occurs wherever air is passing through the coil. Coils are built deep and dense with the gap between the coil fins only millimetres wide.

Trying to deep clean a blocked coil with a high pressure hose is like trying to clean the side of a house with a water pistol through the slot in the letter box.

Enter Jim Metropoulos

It was during a conversation with a frustrated hospital engineer that Jim Metropoulos first realized that an innovation

he had recently developed could transform the health and efficiency of healthcare.

The engineer was tired of replacing heat transfer coils in his facility due to biofouling. It was clear that the dense population of the campus and the 24/7 operations were contributing to significant biofouling, let alone the microbes that were being transferred from ill patients.

The problem was there was no way to remove these harmful microbes from deep within the coils due to the coils compact design.



Don't believe us?

Simply measure the air pressure before and after the coil in a selection of your air handling units. If the reading is anywhere over 250 kpa, then your coil is suffering from significant biofouling. Don't have time to check the pressure? Simply email audits@blueboxair.com and we'll perform an audit for you, free of charge.

Archimedes and the Bath

*It is unknown whether Jim was in the bath or whether he ran down the street naked yelling Eureka...



Jim Metropoulos

The engineer knew his facility was suffering reduced air flow inefficient heat transfer, high energy costs, and poor indoor air quality. He knew all of this, but just couldn't do anything about it.

Detroit – Motown and Innovation

Just a month before this conversation, Jim had toured a General Motors Plant in Detroit, where a plant engineer had been complaining about a similar problem in a large air handling unit.

The problem in the General Motors plant was hydrocarbon fouling from the manufacturing process; a different contributing factor, but ultimately the same problem.

Jim had resolved that issue with a solution that directly injected an enzyme foam into the coils.

The natural enzymes would digest the hydrocarbons with no risk of damaging the soft metal coils.

The key however, was keeping the air handler turned on while the enzyme was injected into the coils. Suddenly instead of conventional chemicals treating only the outside of the coil, the air flow of the system pulled the foam through, penetrating through the coils and migrating out all the hydrocarbon fouling.

Jim's solution fully restored the air flow and heat transfer of the General Motors air handler, but this was simply him responding to a unique customer request. Or so he thought...

The Eureka Moment

Having spoken with the hospital engineer, like Archimedes before him, Jim had his Eureka* moment; coil bio-fouling was not isolated to one General Motors plant, it was a fundamental problem that effects all HVAC systems. The solution was to use the air-conditioning system itself.

The positive airflow from the fan could *force a treatment deep into the tiny spaces within the coil.*

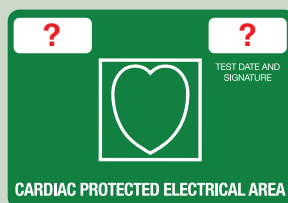
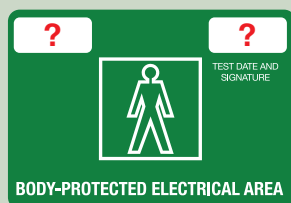
Any solution needed to be carried by the wind. So it needed to be safe. It needed to be odourless.

As is often the case in engineering; when you understand the problem deeply enough, the solution is right in front of you.

Just Another Challenge

Jim realized that the challenge for hospitals was how to make his process completely neutral and odorless so that systems

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could be treated without disturbing patients or hospital team members downstream.

He set to work and after a few reformulations, came up with an entirely odorless enzyme. Suddenly, it was possible to fully restore heat transfer coils in any HVAC system.

Enzymes, not chemicals

In nature, almost anything is food for something else. This is true even within the dark recesses of air-conditioning coils.

Jim identified a naturally occurring enzyme that would consume the bio fouling in the same way that you and I consume carbohydrates and proteins.

Best of all, the use of the enzyme avoided the use of the caustic chemicals that were sometimes used in a last ditch effort to avoid spending capital on coil replacement.

Results

Within days of Jim's invention being applied, it was clear that local hospital engineers had never seen anything like it. Units that had physically seized and had zero air flow were somehow coming back to life.

Hospital engineers were able to avoid replacing units, freeing up capital for other initiatives. Temperatures in troublesome hot zones came back to the desired set point.

We used to have daily comfort complaints. Not anymore – entirely attributable to the team and solution at Blue Box Air.

Frank Prestinenzi, Facilities Manager
Western Health – Victoria, Australia

Better yet; comfort complaints dropped and the units used less energy.

Solving Coils

He didn't realise it at the time, but what Jim solved was a fundamental problem that has plagued the HVAC industry since its invention over 100 years ago.

To date, Jim's process, now commonly referred to as "Blue Box Air", has been used to restore over 35,000 coils around the world and is now quickly becoming the gold standard in how to maintain commercial HVAC systems.

What about Australia?

The story above took place in the USA, but such was the success, word quickly got out to Australia.

Today, with our trusted clients at Western Health in Victoria, we are proud to provide detailed case study data for our implementations in Australia.

Which HVAC coil cleaning technique are you using?

	Blue Box Air™	Pressure Washing	Chemical Cleaning
Does Not Require Shut Down of System	●	○	○
No Rinse Required	●	○	○
Penetrates Any Depth of Coil	●	○	○
Does Not Cause Damage to HVAC Coils, Fins & System Parts	●	○	○
Can Identify and Focus on Blockage Areas in Coils	●	○	○
Removes Biofilm	●	○	○
Surface Area Coverage of Coil Achieved	99%	10%	10%
Water Usage	0.3L per minute	22L per minute	N/A

Average Pressure Drop across all AHUs



26%

www.BlueBoxair.com/welcome

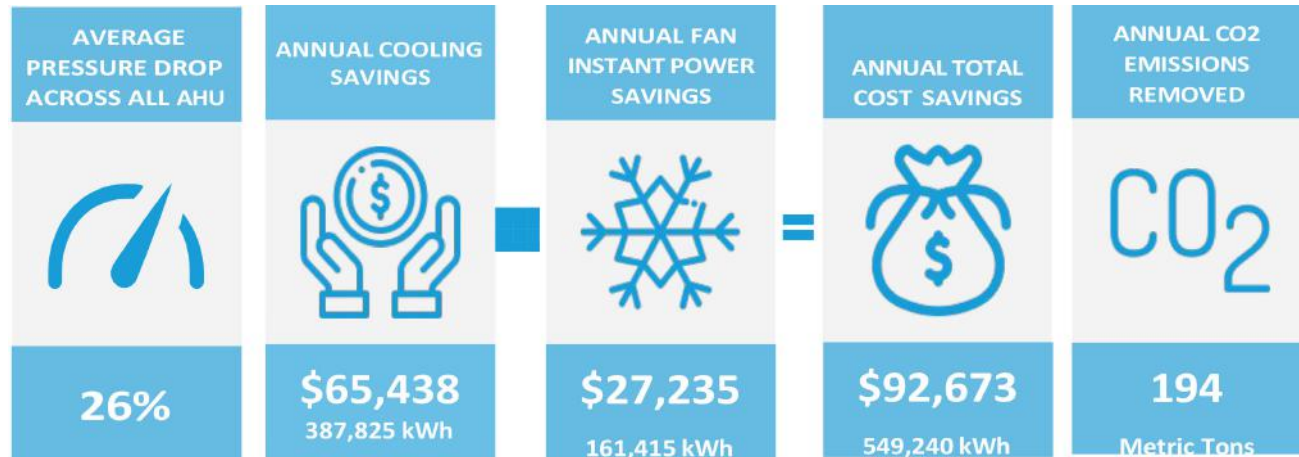
CASE STUDY

Western Health partnered with Blue Box Air to clean all AHU coils across 4 hospital sites

This case study showcases results from the two biggest sites – referenced as Hospital One and Hospital Two.

The photo below shows dirt, grime and biofilm broken down and migrated out from deep inside the coil.

RESULTS & HIGHLIGHTS



CALCULATION METHOD



Average Pressure Drop

The average of all Coil Differential Pressures measured.



Cooling Savings (kWh)

Derived from Cost per kWh, COP (Coefficient of Performance), daily operating hours, operating days per week and total Volumetric Flow Rate.



Fan Instant Power Savings (kWh)

Derived from Volumetric Flow Rate, Pre Read Coil Differential Pressure, Post Read Coil Differential Pressure and Motor Efficiency.



Total Energy Savings (kWh)

Cooling Savings – Chillers do not work as hard because the cleaning process improves the heat transfer in the coils due to removal of biofilm that builds up over time on the aluminium fins.

Fan Instant Power Savings – The cleaning process unblocks dirty coils which results in less pressure and increased airflow having a direct result of less energy required by the fans.

Totals are calculated from the average pressure drop (i.e. not specific unit by unit measurements).



Annual CO2 Emissions Removed

Derived from Power Savings (kWh) and Emissions Factor. (Emissions Factor used for Melbourne is 0.0012 t/kWh).



CONCLUSION

Working with Blue Box Air, it is now possible for Western Health to keep all HVAC systems running at peak efficiency. Doing so will reduce the load on air drive motors, pulleys and pulley belts, through the reduction of back pressure.

The AHU systems are now running with greater efficiency; the constant air flow reduces the demand on chillers and boilers. They are called to run a lot less; this reduces gas electricity consumption, and in turn, total emissions and running costs.

CASE STUDY cont.

APPENDICES

GRAPHS OF PRESSURE DROP RESULTS

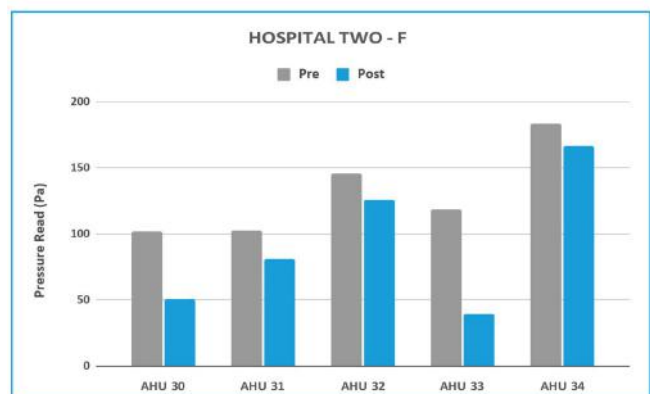
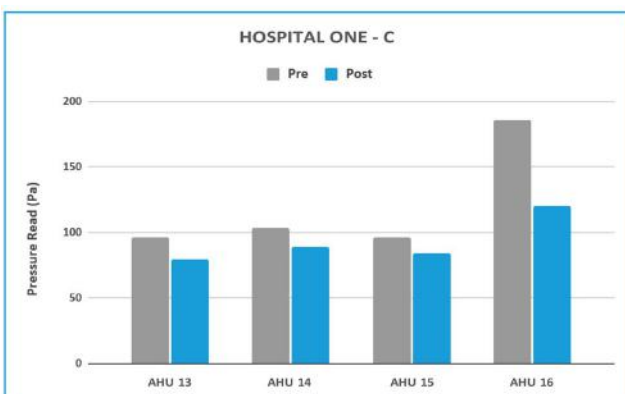
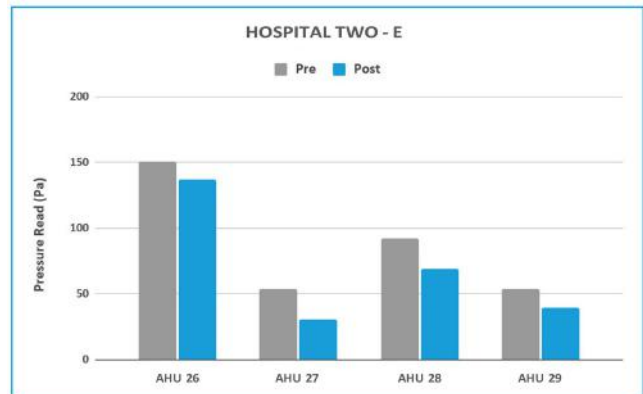
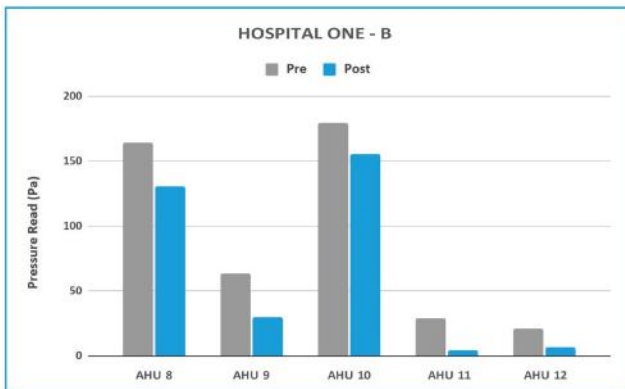
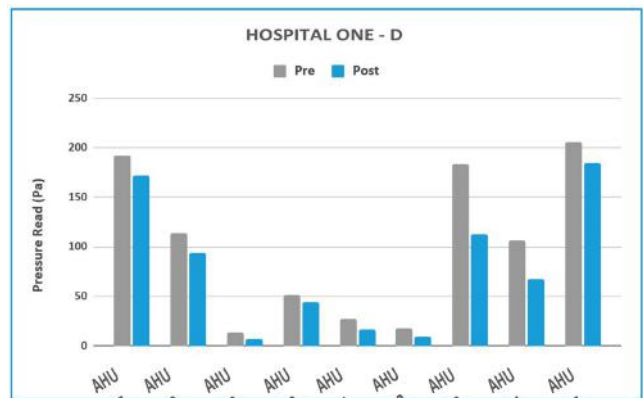
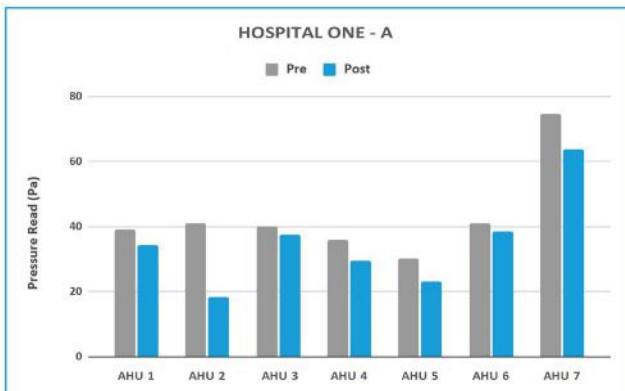
The pressure reading in Pascals (a) is the value of difference in air pressure across the coil in Pascal. This project successfully demonstrates the Blue Box Air technology and process.

The technicians were able to penetrate bio-enzymes through all of the coils and improve air flow and temperature transfer.

With the ability to change up the viscosity of the bio-enzymes, the technicians were able to break up the blockage areas located inside of the coils.

Following the enzyme process, further air register testing showed significant increase in air flows. Multiple ward managers have commented about the increased air flow and improved comfort.

With the change in air filters and the enzyme cleans we are now delivering cleaner and fresher air to all the medical wards and health staff throughout the hospitals.





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FIRE PROTECTION

Anna Giorgianni
Grosvenor

For Healthcare buildings, having a failsafe Fire Protection System (FPS) is a priority. To preserve life, property and business continuity – develop your FPS to align with specific objectives. New building design, retrofits and renovations need an integrated approach to achieve a holistic safeguard system.

Getting building owners and managers, architects, engineers, contractors and consultants involved in early planning ensures risk reduction by covering factors from materials, structural design and addressing heat and smoke movement to safe emergency egress routes.

Proper planning for fire protection involves knowing the four sources of fire: natural, man-made, wildfire and incidental. A strategic, integrated systems approach allows your designer to examine all building elements to produce a total building fire safety system.

Best practice for FPS encompasses detection, alarms and notification and suppression as the three fundamental layers of fire protection.

Compliance and Regulation

Nationwide, all Healthcare buildings must meet the standards specified in the Building Code of Australia. This code classifies different classes of Healthcare buildings, like Hospitals as Class 9a, Aged Care 9b and Class 3 Residential Care. Each class has rigorous fire safety system regulations, and fire-rated materials must comply with AS4072.1 and AS1530.4.

Each fire-rated element is assigned a Fire Resistance Level (FRL). Shown as three numbers, this signals how that element combats fire in test conditions. The first number denotes structural adequacy: the minutes that element remains sound enough to support the relevant structures. Windows and doors aren't assigned numbers because they don't hold anything up.

The second number represents integrity: how effectively the element stops flame and hot gases from advancing. The third number reflects insulation: the number of minutes the element hinders fire spread due to heat transfer.

Both active and passive fire safety systems are crucial for Healthcare buildings. Active elements, such as fire extinguishers or sprinklers, are manually or automatically activated to work. Passive elements like glass fire doors and fire-rated windows continually work to compartmentalise a building. Active elements contain, suppress or put out fires, while passive elements stop the spread of fire and create safe passages for evacuation.

The National Construction Code Australia (NCC) is another regulatory document pertaining to new and existing Healthcare buildings. It's legally enforceable and requires fire safety solutions to facilitate the safe evacuation of building occupants and minimise property damage. Due to factors like size, Occupants and layout, each building may not need to meet all fire safety measures.

Directives over the ditch

Until 1991 the building code in New Zealand was a prescriptive code that followed a set of rules for designing a building. The traditional building code constituted approved documents outlining one way of meeting the performance requirements for a commercial building.

Since 1991, a performance-based approach has superseded the traditional approach to fire safety. This allows

designers to use fire engineering instead of rules to overcome issues. Fire engineering uses principles of fire science, human behaviour and risk management to develop building-specific fire safety solutions.

Building type and occupancy

In the design phase – how a building is used and occupied is critical. A Day surgery, for example, will have different fire-protection requirements than a Hospital.

Mixed-use buildings are occupied in numerous ways – think shopping centres with Medicare centres. And hospitals with and laboratories that feature ground-level retail. It's important to factor in all uses when designing fire safety for these properties. Consider how the order of movement alone affects notification and alarm systems in each zone.

Accurate installation during construction is crucial to ensure all systems uphold the building structure when occupied. Sometimes systems are required to function during partial occupancy while construction continues. Long-term fire protection monitoring and maintenance, including any renovations or refurbis, is also essential. Consider your fire strategy as a living document which continues to frame requirements and responsibilities.

A complete fire strategy in the design phase offers an overview of all scenarios and ways to prevent them. This saves time, money and crucially – lives.

The building basics

There's no such thing as a standard blueprint for fire-protection design, but the systems found in any building typically include the basics of detection, alarms and notification and suppression. Fire protection system design is a science; get an expert involved in the early stages.

Detection devices have come a long way – they can now distinguish different alarm thresholds. And heat detectors can trigger systems even before any smoke is in play. These same alert systems can also close fire doors, summon elevators and communicate with suppression systems like sprinklers. They also connect with life-saving ventilation and stairwell-pressurisation systems within a building.

When it comes to suppression, sprinklers are commercial stalwarts. Each operates independently and features a heat-sensitive element. They're so effective that 90% of all fires are brought under control by less than six of them. A big stat for such small equipment. Alternatively, designers can consider gaseous/chemical suppression systems for MRI rooms.

Whatever the elements of your FPS, it must be customised to the particulars of your property and designed and executed by experts.

Plan for maintenance

Maintenance is a crucial component of any commercial FPS. Even a state-of-the-art system is unreliable if not routinely maintained and tested. Think of it this way – if you work in a building with a sprinkler in your sights, and you know it works – you feel safe.

Understand the relevant fire safety regulations, check your building for expired fire extinguishers and working alarm batteries, and confirm your emergency lighting plan. Make sure you comply with your local fire code for state requirements for regular testing. And remember to set up frequent inspections, see our five steps to fire compliance, and get expert compliance tips.

Grosvenor's specialist fire services encompass the entire life cycle of fire safety and protection assets, including maintenance, repairs, upgrades, construction, compliance and design. We stay on top of your FPS so you can get on with life.

Experienced FPS experts

Contemporary buildings usually have numerous individual fire safety measures that make up a holistic fire safety system. Safeguard your precious people and property with effective fire protection system design and maintenance. Work with our experienced fire asset management experts to design fire safety solutions for your commercial building.

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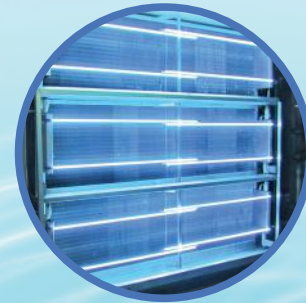


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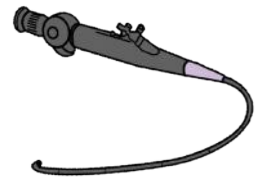
UVC has been independently tested against innumerable pathogens including SARS-like Coronaviruses. There are understood dosages that can be applied for disinfection. Steril-Aire's unmatched very high output UVC works by destroying RNA and DNA of microorganisms with specific energy fields. This allows Steril-Aire to be effective against many types of viruses including: Flu, Coronaviruses, SARS, MERS, and Measles to name a few.

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Tristel™ Rinse Assure

Novel remediation of a decommissioned endoscope washer disinfectant utilising chlorine dioxide (ClO₂) chemical dosing at the North West Cancer Centre - Tamworth, NSW



The North West Cancer Centre (NWCC) is part of Tamworth Hospital and provides oncology services to patients from across the North West and New England regions of NSW. NWCC primarily treats the most prevalent and diagnosed cancers including breast, prostate, lung, and gastrointestinal cancers.

For patients being treated for head and neck cancers, nasal endoscopy is routinely performed to investigate the success of oncology treatments. To offer this service, NWCC has used a Soluscope™ automated flexible endoscope reprocessor to perform high-level disinfection of their nasendoscopes.



Renee Bultitude - Nurse Unit Manager of NWCC oversees the reprocessing procedures and has routinely tested the water quality supplied to the system to ensure that the final rinse water meets the specifications outlined in the Australian Standards for reprocessing reusable medical devices.

Water testing results from early 2014 to mid-2018 were consistent with the current requirements as set out in Table 7.3 from AS/ NZS4187 Amendment 2: 2019 below.

TABLE 7.3 FINAL RINSE WATER – WASHER-DISINFECTORS IN ACCORDANCE WITH ISO 15883-4 FOR THERMOLABILE ENDOSCOPES	
Substance	Specifications
Total viable count (see Note)	≤ 10 cfu/100mL
<i>Pseudomonas aeruginosa</i>	Not detected/100mL
(Atypical) <i>Mycobacterium</i> sp.	Not detected/100mL
Chemical purity	In accordance with WD manufacturer's recommendations
Endotoxin	≤ 30 EU/mL

However, from September 2019, after an outbreak of legionella was identified in the air conditioning system of the oncology centre, the test results for the water supplying the endoscope washer started to show elevated bacterial colonisation.

Despite remedial actions undertaken by Renee and her team, further water test results continued to show concerning levels of total bacterial count over the coming months (colony forming units or CFU > 10) until a significant contamination of more than 100 CFUs/100ml was detected in early February 2020 – leading to the withdrawal and decommission of the endoscope washer disinfectant.

Due to the inconsistent and sub-standard water supply to the department, the NWCC sought an appropriate and alternate high-level disinfection system, the Trio Wipes System, which has enabled the ongoing reprocessing of their non-lumened nasendoscopes without the need for running water or an automated washer disinfectant.

With the implementation of the Trio Wipes System, Tristel proposed a novel remediation of the AFER utilising Tristel's Rinse Assure System to deliver an 8 ½ hour controlled high dose of chlorine dioxide (ClO₂) to flush through the washer disinfectant and purge the system, with the intention of removing biofilm that had accumulated during decommission.

Five water samples were collected from the washer bay -before, during, and after connecting the Rinse Assure System, for independent NATA Accredited laboratory testing to confirm the original presence of microorganism contamination, and to test water quality post ClO₂ treatment process.



The water samples collected at different times throughout the process showed significant changes and appeared discoloured and visibly contaminated (see below).



After only 8 ½ hours of ClO₂ chemical dosing, the Tristel Rinse Assure Series 3 system had reduced TVCs from >100 CFU/100mL to <1 CFU/100mL. Endotoxins were reduced significantly from concerning levels of 21.5 EU/mL to 1.6 EU/mL, and water purity was vastly improved. Below is a summary of test results.

Standard Requirement	Sample 1 Incoming Water 23.11.2020-14:00	Sample 2 EVD before Self-disinfection 23.11.2020-14:15	Sample 3 EVD after Self-disinfection 23.11.2020-15:55	Sample 4 EVD after high ClO ₂ flush 23.11.2020-20:30	Sample 5 EVD after full treatment 24.11.2020-07:00
TVC S10 CFU/100mL	>100CFU	>100CFU	>100CFU	6CFU	<1CFU
Pseudomonas aeruginosa - Not detected/100mL	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Endotoxin S30 EU/mL	21.5 EU	20.4 EU	1.3 EU	<1.2 EU	1.6 EU
Hardness S10mg CaCO ₃ /L	145 CaCO ₃ /L	110 CaCO ₃ /L	110 CaCO ₃ /L	4.2 CaCO ₃ /L	1.3 CaCO ₃ /L
Chloride S10 mg/L	41 mg/L	68 mg/L	61 mg/L	26 mg/L	5.5 mg/L
Silicates S1.0 mg/L	6.4 mg/L	9.2 mg/L	9 mg/L	1.1 mg/L	1 mg/L



“The Rinse Assure system was set up very quickly by Steve the Tristel Service Manager.

It was only the size of a small fridge on wheels, and he simply wheeled it into our washer room and connected it up between the water outlet and the Soluscope™ washer.

He had it set up to go all in just an afternoon and once it was connected, he left it to run overnight. Steve came back in the morning to run his final system tests; collect the final water sample and then he was done.

We were so impressed when the test results came back to confirm the system was no longer contaminated and it could be reused again” - says Renee.

After confirmation of the washer decontamination, it was given a routine service after which the NWCC Operations Manager advertised for it to be relocated to a site needing a working washer disinfectant within the local health district. It now resides in a neighbouring facility where it runs normally, and the team maintain compliant water testing to ensure water supply is in line with standards.

Water supply issues are not uncommon in regional and rural healthcare settings where the origin of the water supply can play a significant role in the variability of quality (e.g. hardness and other contaminants such as silicates), and harsher weather conditions including floods and droughts can also be a major contributor.

Town water can often be dosed with high-dose chlorination treatment to manage microorganism contamination; however, this treatment is designed to treat water for household use and does not necessarily deliver the required specifications for endoscope final rinse water.

The NWCC Tamworth case example of recommissioning a contaminated automatic flexible endoscope reprocessor through intense chemical flushing demonstrates what the Rinse Assure system is capable of in extreme circumstances.

When installed as intended - to maintain final rinse water specifications supplied to endoscopy washer disinfectors - Rinse Assure will deliver a 3-in-1 system for treating water to meet AS/NZ4187 Standards, including:

- a three-stage filtration system that filters particulates down to 0.2µm,
- reverse osmosis treatment of incoming water,
- and chemical dosing with low levels of chlorine dioxide to guarantee ongoing bacteria free water.

Tristel has assisted numerous healthcare sites across Australia by guiding compliant final rinse water collection methods, as well as advising on the independent NATA Accredited laboratories equipped to meet appropriate testing standards.



For more details on the Rinse Assure system visit:
tristel.com/au-en/product/tristel-rinse-assure/

Contributors

Renee Bultitude

Nurse Unit Manager
North West Cancer Centre (pictured right)

Stephen Adnams

Endoscopy Water Service Manager (Tristel)



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HVAC CORROSION PREVENTION

Mark Weir

Blygold

Corrosion is a huge contributor to unnecessary energy and efficiency loss. It causes a loss in cooling performance, reduced indoor air quality, reduced reliability, reduced energy efficiency and a reduction in service life. These issues will cause such things as discomfort and health risks to building occupiers, higher running costs, higher capital costs and more CO₂. There are ways to limit or prevent this corrosion from occurring.

We asked Blygold, a leader in HVAC corrosion protection, to discuss corrosion and the advantages of their preventative techniques. Preventing corrosion can triple the lifetime of your units and giving considerable energy savings.

CORROSION OF HVAC EQUIPMENT

With air-cooled systems, oxidation of the heat exchangers is a major problem. Aluminium is proven to be one of the most suitable materials for this kind of equipment. The advantages of aluminium are:

- Lightweight metal,
- Easy to shape,
- Good heat transfer,
- Cheap.

There is a misconception with aluminium that it should be corrosion resistance, unfortunately this is not always the case. Aluminium forms an oxide film as soon as it is exposed to air. This action is damaging in that it reflects the tendency of the metal to return to its natural oxidation state. If the oxidation layer were evenly spread, it would protect the metal from corrosion. However, the oxidation layer is patchy and because of the humidity and atmospheric pollution the process of oxidation or corrosion may accelerate here.

CONFLICTING MATERIALS

Another problem concerning air-cooled systems is the construction of aluminium heat exchangers. Most aluminium heat exchangers use copper pipes. When two different metals in a conducting liquid are in direct contact with each other, corrosion of the least noble metal may be the result. The parts closest to the noble metal will be particularly affected. This corrosion depends on:

- The potential difference between the two metals,
- The relationship between the two metals; the larger the cathode surface (the noble metal) compared to the anode surface (the base metal), the more corroded the latter will be,

- The conductivity of the solvent, and
- The presence of oxygen.

A good solution would be aluminium to aluminium. Although this type of coil is becoming more and more popular, some reasons why manufacturers are not using this method are:

- Tubes made from aluminium are difficult to weld,
- The tubes damage easier because aluminium is softer than copper,
- It's easier to repair copper than it is aluminium.

SOURCES AND EFFECTS OF HVAC CORROSION

Australia's population is concentrated in industrialised, urban, coastal strips and agricultural regions. All these areas contain sources of corrosion on HVAC equipment. Salt and humidity in coastal regions, sulphur oxides, nitrous oxides, hydrocarbons, chlorides, ammonia, electrolytes, and contaminated dust all contribute to corrosion.

Environmental corrosion of the fin surfaces and galvanic corrosion at the tube-fin breaks down this mechanism which reduces maximum cooling capacity and energy efficiency as the refrigerant condensing temperature is raised to recover cooling performance.

PREVENTING COIL CORROSION

There are two ways in preventing HVAC corrosion. One way is through making sure materials selection is suit to the environments and the second is protective coatings, such as Blygold Treatments.

Mono-metal coils such as copper tube and fin or aluminium tube and fin will avoid galvanic corrosion but do not provide complete protection. For this method to be effective, expensive air testing and environmental assessments would be required to provide the best advice on what construction would be best suited for a particular environment.

Requirement	Specification
1. High Corrosion Resistance	Broad spectrum – urban; coastal; industrial; rural / agricultural
2. Effective Cover	All vulnerable surfaces protected
3. High Thermal Performance	Minimise reduction in thermal performance
4. Durability	Broad environmental resistance; long-lasting
5. On-site application and maintenance	- Can protect new and in-service systems - Maintainable, Repairable, Cleanable
6. Cost-Effective	Acceptable Return on Investment

A protective coating is the most readily available and most frequently applied protection measure. Protective coatings for HVAC can be classified in two separate areas.

- Pre-coat: applied prior to coil assembly, and
- Post-coat: applied after coil assembly

Most manufacturers offer an epoxy pre-coat applied to the aluminium fin as the lowest cost option for improving the corrosion resistance of bare metal.

Post coatings are the sought after alternative to pre-coats. So, what do we need to consider when looking for corrosion prevention options for HVAC equipment?

Epoxy pre-coats generally have a low resistance (1,000 hours) to prolonged exposure to salt and acid spray. A polyurethane post coat will protect for more than 11,000 hours which is over 10 times longer.

Pre-coats only protect the aluminium fin, not the tubes or headers. After the fin is pre-coated, it is cut to size and holes punched in them for fitment to the copper tubes. This cutting exposes the aluminium which then meets the copper tubes, the beginning of the galvanic corrosion process. Polyurethane post-coat will cover all surfaces and joints of the fins and tubes leaving your coils protected.

Due to epoxy pre-coats low thermal conductivity, it creates an insulation layer at the critical fin-tube junction when fins are formed, and coil is assembled. This can create a capacity loss of up to 15%. A Polual XT post-coat by Blygold, contains an aluminium pigment which boosts thermal conductivity. Combine this with a low 25-micron dry film thickness (DFT) and you will minimise thermal and pressure losses. Capacity losses with this type of coating are as low as 0-3%.

With age and exposure to the elements, epoxy pre-coats loose adhesion and have a lower mechanical resistance. The polyurethane post-coat has excellent adhesion to most metals; aluminium and copper, plus have the added benefit of excellent UV protection and chemical resistance.

The post-coat treatment can be applied in the workshop or on site and is maintainable, repairable, and cleanable.



Pre-coats are generally applied with no further ability to maintain or service on site being available.

With a lower life expectancy, pre-coats will generally cost the client more in the future. The post-coat treatment is there for the life of the unit.

HVACR efficiency loss accounts for a significant proportion of Australia's energy consumption, business costs and CO₂ emissions. Asset owners and managers are now even more aware of this plus the high maintenance and replacement costs and are looking for alternatives to prolong the life of their equipment.

Corrosion of heat exchanger coils is a widespread problem and one that adversely impacts the performance and energy efficiency of HVAC systems. Applying Blygold's most effective post-coating treatment to these units will limit or prevent HVAC coil corrosion and its adverse impact thus saving energy and saving money and making our environment more sustainable to live in.

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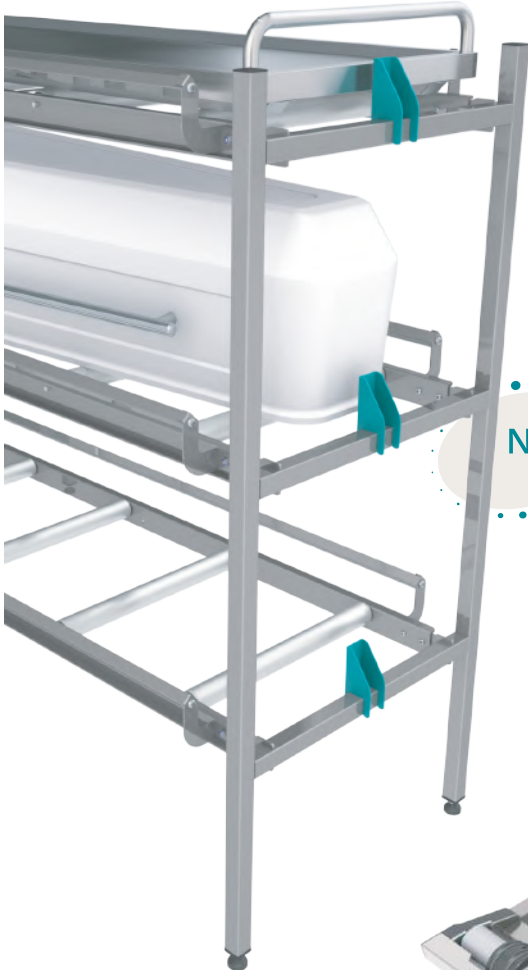
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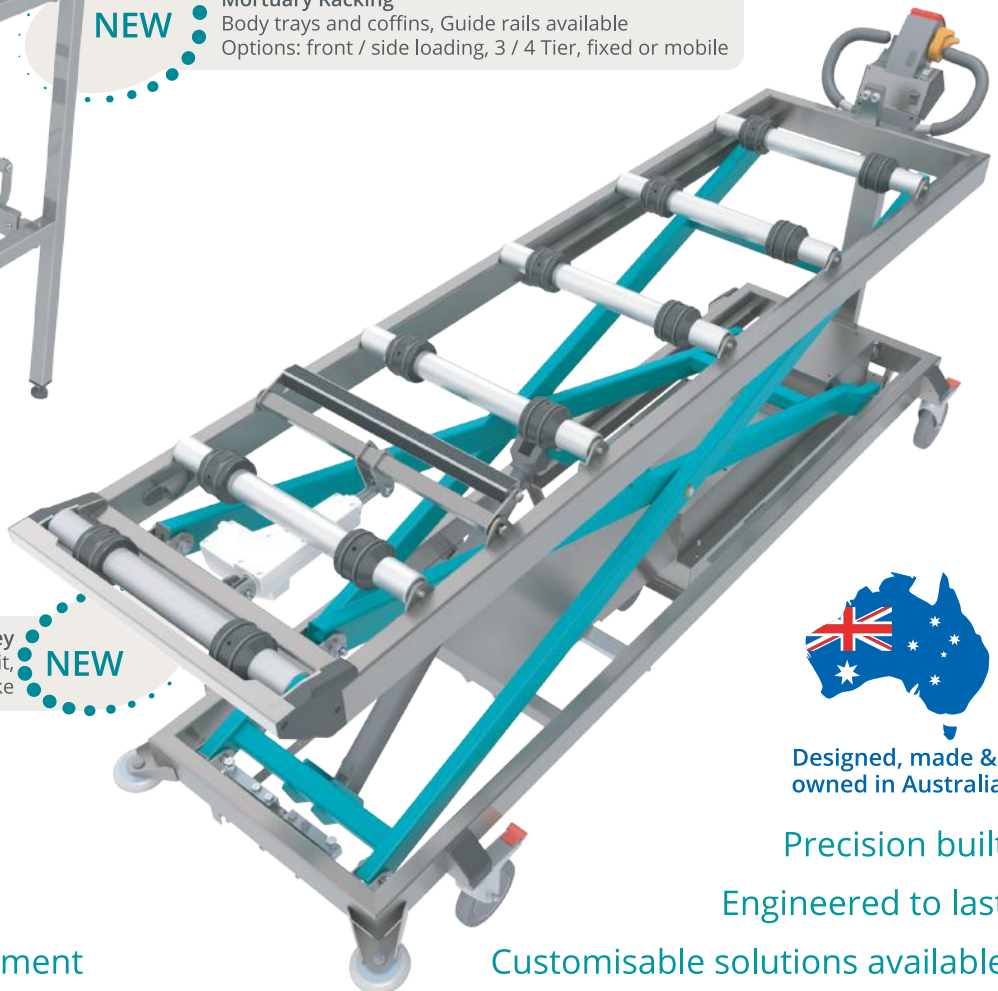
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WORKPLACE EQUALITY

CHALLENGES FOR WOMEN IN HEALTHCARE ENGINEERING

Daniela Pedrini

Past-President, IFHE

In the past 15 years, while much progress has been made for working women, men still hold a clear majority of the most important roles in healthcare. Here, Daniela Pedrini, president of the Italian Society of Architecture and Engineering for Healthcare (SIAIS), discusses how girls and women can be encouraged to enter and remain in the sector.

When it comes to equality in the workplace, women still have a long road ahead, facing considerable barriers and obstacles in their working lives.

While the ground may be considerably more even than it was a few decades ago, there is still a long way to go before we can say that there is true equality in the workplace (and beyond). Indeed, a lot of these issues are much more nuanced, and hence easier to dismiss by many who believe we have already achieved gender equality.

Steps like government legislation, corporate diversity policies, and individual action can go a long way. By raising awareness of these issues and educating people on them, we can continue to pave the way for future generations as well as create safe spaces for women to excel in.

How can we address these workplace issues?

Men still hold most of the most important roles in healthcare. Currently, 69 per cent of global organizations are headed by men and 80 per cent of board presidents are men.

Whether it is under-representation of women in executive roles, lack of childcare support, harassment, or biased and discriminatory behaviour, these issues are an ongoing occurrence for women across all industries and organisations around the world.

In order to climb the career ladder and follow our professional ambitions, we must first break the glass ceiling.

The WHO Agenda 2030 has placed gender equality among the seventeen goals for sustainable development: the enhancement of the role and talents of women and equal opportunities between women and men in economic development.

It is no coincidence that the International Monetary Fund estimated that, in a hypothesis in which female employment was numerically equal to that of men, the growth of GDP (in Italy) would rise by 11 per cent. Furthermore, several studies carried out in recent years show that organisations that apply



Figure 1. The WHO Agenda 2030 includes gender equality.

true gender equality internally are more innovative, productive, efficient, and better positioned on the market than their competitors.

Yet women continue to be weak players in the labor market.

We need only look at Italy, where female employment is about 18 per cent lower than that of men and women earn about 16 per cent less than men, despite being better educated. (2019, Italy Censis).

The path to align these disparities will be neither easy nor short-term.

The challenges

Some of the biggest challenges women face in today's workplace, in a male dominated environment, include the following:

1. Pregnancy discrimination

Many working women are faced with a major dilemma when it comes to starting a family.

Pregnancy discrimination occurs when a woman is treated unfairly due to pregnancy, childbirth, or a medical condition related to their pregnancy. But it also involves bias towards an expectant woman, and behaviours such as social isolation, stereotyping, intrusive comments, change of duties, lack of development opportunities, and reduced pay.

While there are laws in place that prohibit the unlawful termination of employment for pregnant workers, the latest *Women, business, and the law* 2021 report found that 38 of 190 economies do not, in fact, prohibit dismissal of pregnant workers in their laws.

2. Sexual harassment

Workplace sexism and harassment have become even more evident in recent years, with women plucking up the courage to share their traumatic experiences, propelled somewhat by the #MeToo movement, exposing just how widespread sexual violence, abuse, and harassment are in professional environments and beyond.

Sexual harassment can manifest in multiple forms, from sexual remarks about a person's body, appearance or clothing, to unwelcome physical advancements and any other nonverbal actions that can create a hostile, offensive, or intimidating environment.

It is not surprising, then, that 99.8 per cent of harassment cases go unreported, despite findings suggesting that over five million workers are sexually harassed at work every year in the US alone.

3. Gender pay gap

The gender pay gap is something that is widely discussed in today's working world.

The numbers do not lie: a woman will most likely earn a lower salary than a man applying for the exact same position.

4. Racial discrimination

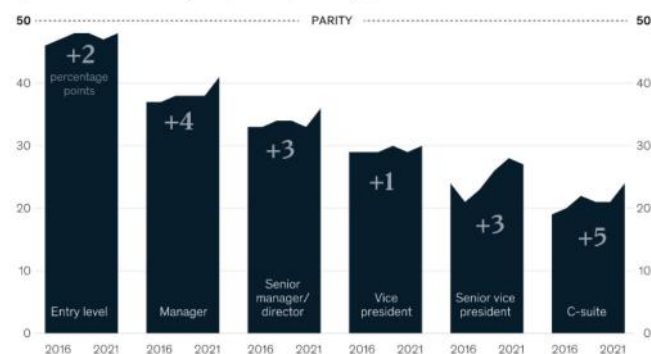
Sadly, racial discrimination is still prevalent in the workplace.

The women who experience micro-aggressions are also more likely to have a negative feeling about their careers and be impacted by burnout.

5. Breaking the glass ceiling

Career advancement is much trickier for young female professionals who need to work harder than their male peers in order to earn recognition or praise.

Representation of women by level, 2016–21,¹ % of employees



¹Data as of end-of-year 2016 and end-of-year 2020.
Source: Women in the Workplace 2021, LeanIn.Org and McKinsey, 2021

Figure 2. Representation of women by level, 2016–21.

If we take a look at the CEOs of the largest corporations, we notice a recurring pattern: that the vast majority are men. The reason is unknown, but in most workplaces, there is a general feeling that men advance faster, and women are deemed 'incompetent', even when they have not been given the opportunity to prove themselves. In fact, according to McKinsey & Company, for every 100 men who are promoted to managerial positions, only 85 women are promoted.

6. The grooming gap

Also known as the beauty expectation gap, this phenomenon encapsulates the social norms that are imposed on women regarding their grooming and appearance, and the financial and time constrictions it imposes.

A study found that appearance, both for men and women, plays a key role in career advancement and income potential.

7. Work-life imbalance

Another noticeable challenge that working women face is the lack of a fair work-life balance. Of course, everyone struggles with balancing their work and personal life. This was made especially clear during the COVID-19 pandemic, with workers working from home reporting that they were unable to switch off and maintain boundaries with their work.

This imbalance placed a significant amount of pressure on working women, which also placed a strain on their career and advancement within their roles, but also resulted in serious burnout.

8. Lack of childcare support (or caring for elderly parents and relatives)

Following up from the previous point, it is important to address the detrimental effects that lack of childcare support can have on working mothers and their careers.

Indeed, research demonstrates how the high cost of childcare and limited help offered by employers is reducing women's participation in the workforce; from reduced hours to pay cuts to loss of employment. Indeed, the same research found that just as fee-based childcare costs began to increase, the number of women in the labour force entered a 20-year-long decline.

9. Ego clashes

This phenomenon is not talked about as much as it should.

Women who find themselves progressing in their careers and achieving their professional objectives may face backlash from male partners. This behaviour often manifests as sarcasm, passive-aggression, discouragement, and guilt-tripping.

However, this does go to show that even when women do manage to break the glass ceiling, this may have negative implications for their personal life.

10. Being talked over

This is a scenario that women are all too familiar with: you start making a point during a meeting only to be interrupted

halfway through, talked over and have your idea handed back to you and presented as the culprit's suggestion.

This, however, should not detract from the fact that women get interrupted 50 per cent of the time in meetings; and 38 per cent have experienced others taking credit for their ideas, according to McKinsey and Lean In's *Women in the workplace* report. Another study also suggests that women are 33 per cent more likely to be interrupted when speaking.

11. Exclusion in male-dominated fields

An industry is considered to be male dominated when it consists of 25 per cent of women or less. Examples include engineering, finance, manufacturing, aviation, and IT. It's also important to mention that male dominated fields have a higher earning potential, even if women within them still earn less.

Unfortunately, women who do choose to pursue a career within these fields are often faced with considerable challenges. These include pervasive stereotypes about their abilities and skills, higher stress and anxiety compared to women working in different fields, and lack of career advancement opportunities.

So while women in STEM fields have been blazing the way for other female professionals, there is still a long way before women are welcomed to the top positions in many industries.

12. Gender bias and discrimination in interviews

Unfortunately, inherent gender bias is exhibited by both male and female hiring managers, who have been found 1.5 times more likely to hire a male over a female candidate that are equal-performing candidates.

Whether these prejudiced behaviours are subconscious or intentional does not matter as, either way, they can stand in the way of a woman getting hired for a job she is evidently qualified for.

What we can do? What can leaders do?

Table 1 on the following page illustrates a few of the challenges women face in the workplace.

In detail, although women comprise half of the world's workforce, participation rates in some sectors are considerably skewed. For example, health care and social services have a high percentage of women, with around 77 per cent. In stark contrast, women in male dominated sectors represent only about 12 per cent of the total workforce.

With such a small proportion of women, it makes sense that women who perform managerial roles in male-dominated workplaces may face unique challenges.

In these sectors, they may find policies that either do not support women in the workplace or actively exclude them.

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For example, some women reported not having changing rooms available to them (where men in the same team or location had ample space assigned).

When women work in non-traditional roles, it is still seen as something of a novelty. Because of this, many women feel there is a lack of social, emotional, and work support available to them. The underlying assumptions surrounding gender roles have had a negative effect on organisational culture, putting females at a disadvantage.

Toolkit for women facing challenges in management roles

Having practical strategies can be helpful for women when faced with discrimination or resistance in the workplace.

- Vary between *feminine* or *masculine* skill sets or attributes as needed.
- Work with a mentor in the industry.
- Focus on the positive elements of the job instead of dwelling on the negative.
- Speak up about discriminatory hiring or promotion practices.
- Call for recruiting practices that actively encourage women to apply.
- Support fellow women in the workplace.

According to a recent report, women also tend to focus on the challenging and engaging nature of the work. By dedicating themselves to the job at hand, they were able to let the politics go as they became accustomed to their role.

Recognition and success were also critical to women's perseverance. While this does not always have to be official, small things like having male colleagues nominate them as safety representatives or coming to them for advice can make a huge difference to women's work satisfaction and effectiveness in male-dominated industries.

In Italy, a new Law 162/2021 has recently come into force, enacted to promote the certification of gender equality and lead companies towards concrete policies and measures aimed at reducing the gender gap with respect to growth opportunities, wage and job equality, policies for the management of gender differences, and the protection of motherhood. In order to access all the advantages (tax, participation in tenders, etc.) provided for by the provisions, companies may request accredited certification of the management system for gender equality according to the Reference Practice UNI / PdR 125: 2022 from accredited bodies from Accredia.

Change ahead?

Another emerging factor that neuroscience has confirmed is the genetic difference in the attitudes of men and women, due to the different brain development that tends to be complementary.

In the typically male-dominated and traditional world of finance, for example, the process of accepting the unsustainable dominance of the male brain in management teams has begun and is already giving its first results: some asset allocation managers specifically require female fund managers or investment teams made up of women.

The pandemic and workplace

The pandemic continues to take a toll on employees, and especially women. Women are even more burned out now than they were two years ago, and burnout is escalating much faster among women than among men. Additionally, four in ten women have considered leaving their company or switching jobs – and high employee turnover in recent months suggests that many of them are doing just that.

The role of women in health, research, and science

In the fight against COVID-19, the contribution of women has been fundamental, especially given their dominant presence in the health sector.

Despite the weight of women in the industry, there is still a gender gap in favour of men in terms of pay.

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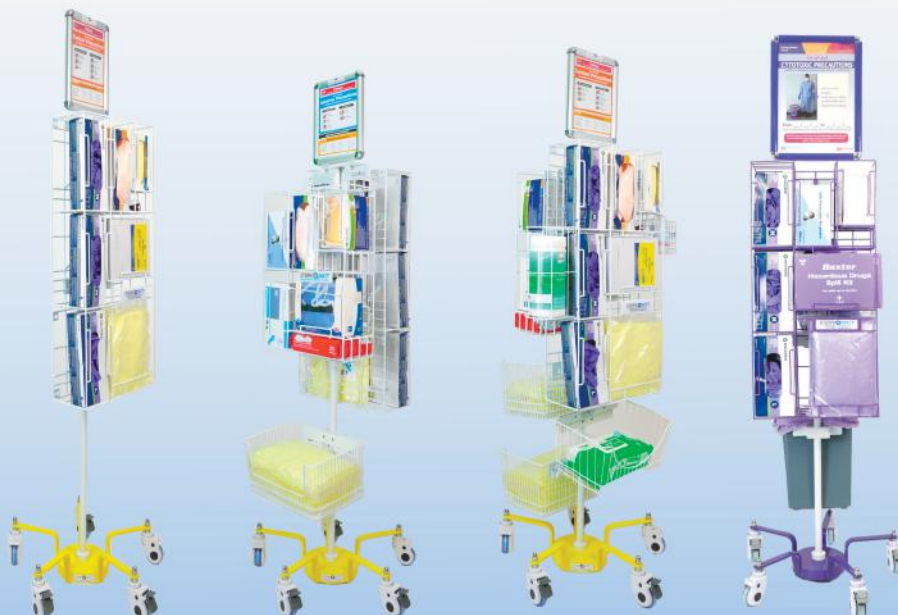
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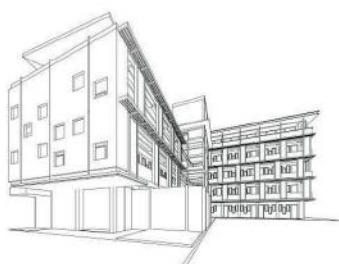
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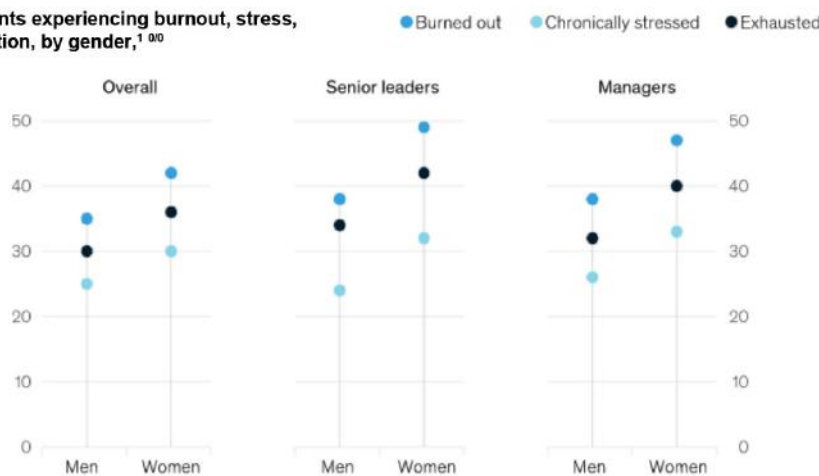
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	Challenges women face in the workplace	ACTION –What can leaders do?
1	Equal Pay – women still make less than men. Women around the world continue to face a wage gap.	• Ensure that there are no gaps in your workplace by doing a wage audit • Implement a ‘no negotiations’ policy • Support pay transparency • Evaluate recruitment, promotion, and talent development systems for gender bias.
2	Flexible Work Arrangements – Working flexibly is an issue for many women. Flexible work arrangements (FWAs) define how, where, and when employees’ work, allowing them to best manage their career and personal priorities. Once seen as an employee benefit or an accommodation for caregivers (primarily women), flexible work arrangements are now an effective tool for organisations to attract top talent as well as a cost-savings measure to reduce turnover, productivity, and absenteeism.	• Switch their focus to productivity and results, and not time spent at the desk • Seek out managers who currently work flexibly and find out what works and what doesn’t • Encourage your own team to be a role model and consider utilising FWAs.
3	Access to Hot Jobs and Role Models – Why don’t women have the same access to career-making roles as men? Not all leadership opportunities are created equally, all jobs provide the same degree of and not career advancement.	• Make a deliberate investment to help women colleagues • Model inclusive leadership behaviours • Empower employees to negotiate their roles • Be intentional about appointing highly qualified women to your executive team, corporate board, C-suite, and/or CEO position.
4	Race and Gender Bias. Everyone has unconscious biases – even the best-intentioned people – which play out in their everyday lives and interactions such as those in the workplace.	• Don’t shy away from talking about uncomfortable or difficult topics. Each of us – regardless of our race or gender – has a role to play • Be open to feedback and learning • If you see harmful behaviour in your workplace, say something. Otherwise, your silence makes you complicit in it • Build trust and confront inequities head on through organisation-wide strategies.
5	Sexual Harassment – Women at all levels of employment and all levels of workplace are affected. Sexual harassment remains a widespread, and at least one-quarter of women having reported some sort of harassment on the job. This inappropriate behaviour costs employers in many ways: increased absenteeism, persistent job turnover, and low productivity and engagement. Individually, women become depressed, experience anxiety, or quit all together in the hope of avoiding continued harassment.	• Develop and implement prevention strategies such as a highly visible community education campaign • Ensure access to workplace reporting mechanisms • Train managers to report any complaints or observations of harassment • Thoroughly investigate all complaints of harassment and take corrective action.
6	Double-Bind – Women’s ability to lead is often undermined by gender stereotypes. The stereotype that men ‘take charge’ and women ‘take care’ puts women leaders in various double binds. For example, women are judged as being too hard, too soft, and never just right. Women leaders are also seen as competent or liked but not both. Also, men may be seen as having the ‘default’ style when it comes to their ability to lead effectively, meaning women spend part of every day repeatedly proving they too can lead. This effort leads to women working twice as hard as their male counterparts.	• Do not discredit the effectiveness of women leaders based on gender stereotypes • Challenge yourself whether you are judging people fairly – reverse the gender of the person in question and see if it makes a difference in your thinking • Expose employees to peers – including men – who are willing to advocate for women leaders • Provide diversity and inclusion training to help employees understand the effects of gender stereotyping.

Burnout, stress, and exhaustion continue to affect women more than men.

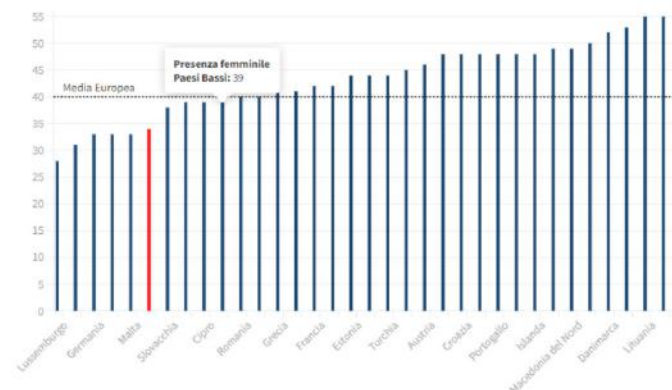
Respondents experiencing burnout, stress, or exhaustion, by gender,^{1 000}



¹Question: In the last few months, which of the following have you felt consistently at work?
Source: Women in the Workplace 2021, Leanin.Org and McKinsey, 2021

McKinsey & Company

Figure 3 – Burnout, stress and exhaustion continue to affect women more than men.



Source: Eurostat Elaborazione Orizzonti Politici

Figure 4 – The percentage represents the female presence in the category of scientists and engineers on the European continent.



Figure 5 – UNESCO and UN-Women established the International Day of Women and Girls in Science on February 11th.

The United Nations estimates that the wage gap between men and women is still 11 per cent in the health sector globally.

The number of women also continues to grow in other scientific fields. In 2019, there were more than 6.3 million female scientists and engineers in Europe, representing 41 per cent of the employees in those fields. Female scientists and engineers exceed 50 per cent in almost all areas of Spain, Poland, and Sweden, as well as Lithuania (55 per cent), Latvia (53 per cent), Denmark (52 per cent), and Norway

(55 per cent). Italy is not among the best: with slight differences from one area to another, a mere 30 per cent and 35 per cent of scientists and engineers are women.

With exception to the biomedical sector, women are still generally in the minority in computer science, physics, mathematics, and engineering.

Many female researchers thus choose not to pursue research, which is why women's academic careers tend to be shorter than that of men. Another factor to take into consideration concerns the visibility reserved for women – they are invited to conferences less often than their male colleagues – and the awarding of prestigious awards are fewer.

To promote the presence of women in scientific disciplines, UNESCO and UN-Women (the United Nations organization dedicated to gender equality) established in 2015 the International Day of Women and Girls in Science which is celebrated on 11 February. This is the underlying message: to tackle the great global challenges, science and opportunities for women need to improve.

STEM subjects and the gender gap: an increasingly evident problem

The technological revolution happening throughout the world requires sufficiently educated and specialized people with the technical-scientific knowledge required by industry 4.0 that characterizes STEM study paths, such as science, technology, engineering, and mathematics courses. Unfortunately, however, the female population is finding itself partly excluded from this epochal change. The numbers speak for themselves: in the world, fewer than 4 out of 10 graduates in STEM subjects are women. For this reason, even in this area there is talk of a real gender gap, both in terms of education and work, as a result.

Why are girls not choosing STEM paths?

The reasons why women who choose STEM pathways are a minority are many and range from individual factors to social and family background elements. Individual factors include lower personal motivation and self-esteem, especially in subjects such as mathematics. The biological reasons why women would naturally be less capable in these subjects seem to be outdated.

As for the social and family aspects, first of all there is the prejudice and stereotype that women and scientific subjects are not compatible. This social perception creates a sort of psychological barrier for women, who since childhood are prone to feel inferior to males in these areas. Sensation to

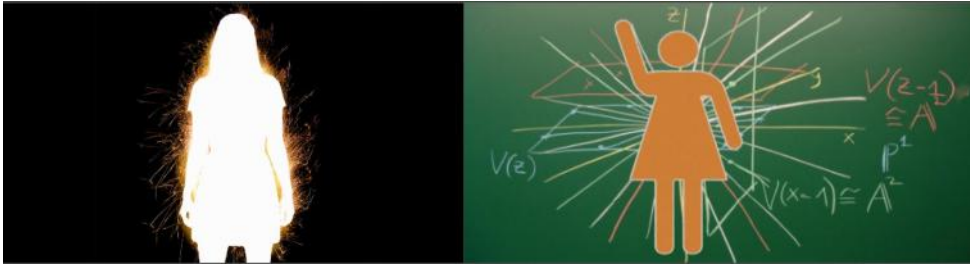


Figure 6 – The gender inequality in STEM study paths, such as science, technology, engineering and mathematics courses.

of women who received an engineering degree either never enter the profession or quit.

So, we must protect the path for the future female engineers by creating a positive perception of the profession and by encouraging women throughout the learning processes. I think the emphasis must be on

creating an attractive perception and safe environment for young women to study, participate and continue to pursue careers in Engineering before and especially after the work begins.

Why are there fewer female engineers?

Female engineers have highlighted the challenges they continue to face in their professions, despite more women entering these roles.

Gender balance is not solely a women's issue, but also an economic issue.

Meanwhile, a lot more must be done to stem the loss of qualified female engineers from the sector.

Although 23 per cent of engineering graduates are female, according to the latest data, just 12-13 per cent of those working in the sector are women.

The fall-off between graduate numbers and women working in the profession requires greater focus and more creative engagement between professional bodies, engineering organisations and the education system.

Breaking down barriers and encouraging girls to enter the profession and young women to remain in the sector is crucial, as is showcasing the many varied, exciting career opportunities that are on offer in this respect.

I have been fortunate enough to be elected president of both the IFHE (2nd female president after Liliana Font) and the first IFHE EU president in 2017. I am also current president of SIAIS, the Italian National Association of Engineers and Architects. SIAIS has a council board that make executive decisions for the organisation, which is made up equally of men and women. Our team, therefore, has a diverse and balanced view and it is a progressive example not only to other national organisations, but to international ones like IFHE.

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Figure 7 – Woman in Engineering

which even the gender stereotypes of teachers sometimes contribute. The lack of models in the collective imagination also plays its part. In general, it seems that these social co-factors are however more decisive than the individual ones.

The subjects of tomorrow: disparity today means disparity in the future

The historical and persistent current pay gap that exists between women and men is a clear problem. The STEM fields represent the jobs of the future and those that will guarantee greater career opportunities and economic returns.

Resolving the gender inequality in STEM subjects means addressing the wage gap issue, as more women can and will compete for the jobs of the future.

Women in engineering

Although women have made great strides in previously male-dominated professions in the last few decades, engineering remains one of the occupations where female employees are hugely underrepresented. Why is the gender divide still so wide in technical fields?

Since 2012, the number of women studying engineering has remained virtually the same. According to a 2019 report from the United States Census Bureau, female engineers represent only about 13 per cent of the total engineering workforce.

While women make up about 20 per cent of engineering graduates, Harvard Business Review reported that 40 per cent

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HOSPITAL ENGINEERS' ROLE IN DISASTER MITIGATION

Tokyo Teishin, Hiroshi Yasuhara and Hidenao Atarashi

University of Tokyo Hospital

Tokyo Teishin Hospital director, Hiroshi Yasuhara, and Hidenao Atarashi of the University of Tokyo Hospital, present their findings about the important roles of hospital engineers learned from their experience of the Great East Japan Earthquake of 2011.

Natural disasters, including the coronavirus pandemic, have a massive influence on the healthcare services. Japan experienced a massive earthquake in 2011. More recently, in 2019, Typhoon Hagibis triggered floods and caused damage to many healthcare facilities. The last earthquake caused direct injury to patients and healthcare workers. In addition, it had various other influences besides the direct impact.

One of the most serious collaterals is a blackout, because modern medical activities are supported by a number of electrical devices. Therefore, once there is a blackout, almost all sophisticated medical equipment cannot be used.

Even if a machine is equipped with a battery, it does not last for a long time.

We also experienced afterload impact such as the administrative restriction of electricity and water supply according to article 27 of the Electricity Business Act (see Table 1). During the disaster, we realised that approaches to both blackouts and energy saving are key issues at hospitals in remote areas. Here, we present the important roles of hospital engineers (HE) we learned from our experience of the Great East Japan Earthquake of 2011.

Methods

We categorised the major issues we had to resolve according to the timeline of the earthquake. These included direct damage to humans and property and indirect sequelae. For this purpose, we focused on the key issues of blackout and energy saving (see Tables 2&3). In terms of infrastructure, the performance of in-house generators, the location of uninterruptible batteries, the hospital information system and water supply are important.

In Japan, medical devices that require electricity are supported by not only charged batteries, but also by hospital utilities. In fact, the machine-mounted batteries were not sufficient to continue to drive machines in the disaster we experienced. The power supply for medical equipment should be assessed in each department in the context of emergency circumstances. In addition to checking whether medical

Table 1. Article 27 of Electricity Business Act of Japan.

Restriction of Use of Electricity

Article 27 When it seems that if no adjustment is made to the supply or demand for electricity, a shortage of electricity supply will adversely affect the national economy, standard of living or public interest, the Minister of Economy, Trade and Industry may, to the extent necessary for resolving such a situation and pursuant to the provision of a Cabinet Order, restrict the use of electricity supplied by a General Electricity Utility, Specified Electricity Utility or Specified-Scale Electricity Utility by limiting the power usage or peak load or specifying the purpose of use or the date and time when power usage should be stopped, or restrict the receiving of electricity from a General Electricity Utility, Specified Electricity Utility or Specified-Scale Electricity Utility by limiting the capacity of receiving electricity.

equipment had batteries, the kind of outlet to which the medical equipment in each department was connected was checked.

In terms of outlets, we have three types. These are differentiated by colour: white, red and green. White outlets are ordinary ones, which means they cannot supply electricity during a blackout. Red and green outlets are for emergencies. The difference between them is whether the outlet can constantly supply electricity without interruption. Red outlets stop supplying electricity for a second at the start and end of a blackout but recover immediately, whereas green outlets are uninterrupted.

The power of in-house generators should be assessed after the location and the type of outlet are confirmed. Our hospital has a total of 1,210 beds, and the power company is contracted to supply 44,100 kilowatts (kW) of electricity. The hospital is divided into areas depending on the source of electricity.

There are two in-house generators. One has an output of 3,200 kW by an air-cooled engine, while the other has an output of 2,000 kW. A major difference between the two generators is the operating time. One can work for approximately 69 hours, while the other can work only for seven hours.

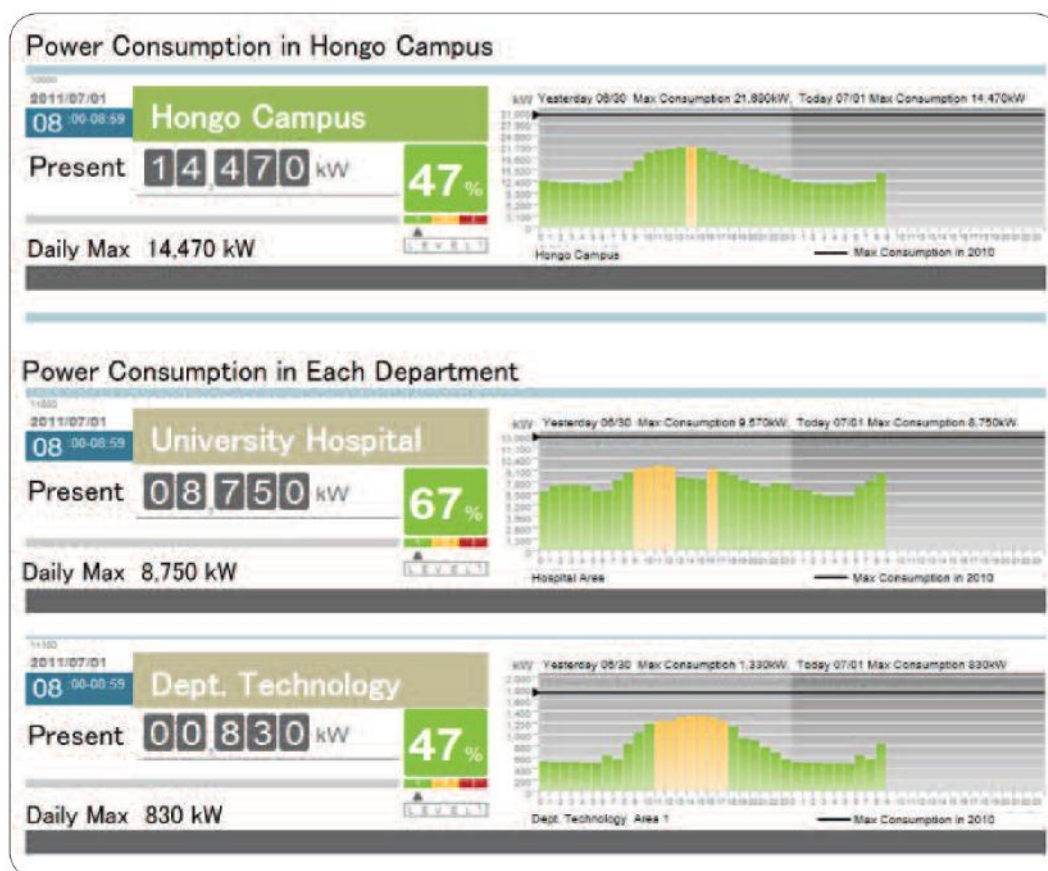


Figure 1. Visualisation of power consumption on web.

Although a hospital engineer is registered by a public association, he/she... should play all the more important roles in the mitigation of natural disasters as well as their management.

There is another aspect of prevention of collateral damage from a natural disaster. We need to consider preventive measures against future disasters. The BCP (business continuity plan) is one strategy. This approach requires knowledge not only on the specifications of medical equipment and instruments, but also on building standards and building codes.

Results

In terms of direct damage, the medical staff checked whether patients had been injured and took care of patients in the wards and outpatient department immediately after the first shock of the earthquake. Fortunately, there were no seriously injured patients. At the same time, the medical staff and office workers went around the building.

As most buildings in Japan – including our hospital – have an earthquake resistant or absorbing structure, we

experienced limited patient injury and destructive damage of the building. Physical damage included minor cracks in walls, drug bottles falling over or off shelves, and bookshelves falling over. Utilities such as water supply, electricity and medical gases were almost intact.

There was some indirect damage. In the outpatient department, it was requested that patient care should be stopped as soon as possible. In the operating room, surgeons were asked to stop operations in process after determining the appropriate timing. Planned operations were cancelled. Then, outpatient consultations were rescheduled because of limitations of the transport system. Operations were also rescheduled, mainly because of aftershocks.

Three days later, as the Fukushima Daiichi nuclear plant was severely damaged by the tsunami caused by the earthquake, we suffered from its collateral damage such as shortage of electricity due to restrictions on electricity, requested by the government.

There are several approaches to blackouts undertaken by the whole hospital. First, we need to determine a fundamental plan for the whole hospital. Next, each department needs to determine its action plan for blackouts. Furthermore, we need to develop a working group and carry out a simulation. Finally, we need an action plan to avoid blackouts.

We also had approaches to energy saving. Our fundamental policy was that patient safety is a top priority.

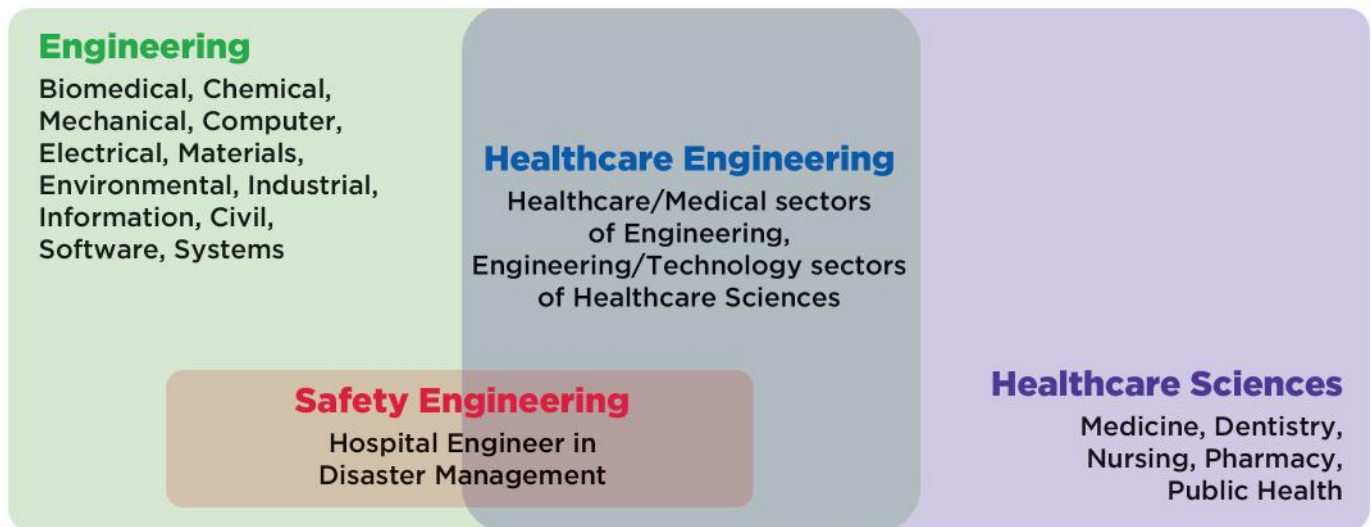


Figure 2. Healthcare engineering and disaster management.

Personnel specialised in utilities, such as HE, analysed the collected data and simulated the energy consumption. According to this simulation, we could set the level of energy consumption. We maintained room temperature at the minimum required level and used the minimum amount of medical equipment.

The influence of the electricity shortage spread throughout the hospital. In terms of hospital utilities, we had to reduce lighting by 50 per cent. Regardless of the fact that we did not experience a blackout in our hospital, we had to stop the air conditioning and the hospital information system. In the central laboratory, we had to stop blood tests.

We had to stop central sterilisation due to a shortage of power and water.

Besides the above-mentioned approaches, the whole hospital made an effort to save energy. We visualised the energy consumption on the web. All staff in the hospital could see the data on power consumption. Above all, information-sharing on power shortage is most important. Again, the HE created the basic data for this approach (see Fig 1).

In the last earthquake, we formed a working group on energy saving. At the first meeting, a report on the number and types of outlets and medical equipment was requested from each department.

This approach also served to make all healthcare staff aware of where the emergency outlets were located in the hospital. At the second meeting, the collaboration of medical staff was confirmed.

Based on the answers to the questionnaire, we stratified the measures depending on the level of requirement (see Table 4). At the hospital staff meeting we shared information on energy saving among the medical staff. The responses to

Table 2. Estimated major influences of blackout on hospital functions.

Category	Description
Utilities	50 per cent reduction of lighting Stopping air conditioning except for OT and Outpatient Dept Stopping EMR system
Radiology Suite	Stopping large diagnostic equipment (e.g. CT, MR, angiography) Checks needed after recovery
Central Laboratory	Stopping blood sample testing
Central Sterilisation	Stopping function because of lack of power and water
Operating Theatre	Air conditioning for only limited period Stopping anaesthetic computer Stopping image server
Hospital Functions	Suspended outpatient services Inactivated hospital server Stopping EMR in wards

Table 3. Key issues for blackout and energy saving.

Infrastructure of hospital
• Performance of in-house generators
• Performance of interruptible batteries
• Usability of medical gases during blackout
• Air conditioning and water supply
• Hospital information system
Medical equipment
• Types of outlets to which medical equipment is connected
• Equipped with battery? (performance of battery, if any)
• Information-sharing in power shortage
• Between medical team and administrative personnel

Table 4. Approach to energy saving.

Level of requirement			
Highest	High	Low	Lowest
Measures by whole hospital			
• Limit use of elevators • Raise room temperature • Limit lighting • Shift time of lighting	• Install emergency outlets • Limit air conditioning • Limit use of elevators • Use of LED lights	• Completely stop air-conditioning • Limit blood tests • Limit outpatients	• Shift working time to weekend • Stop surgical procedures • Limit number of working staff
Measures by Departments			
• Raise temperature of refrigerators • Raise temperature of water	• Turn off monitors in outpatient areas	• Turn off refrigerators	• Stop research

the questionnaire were presented, and a fundamental policy on energy saving was confirmed.

Consequently, this had a favourable impact on the financial balance of the hospital. We could save 13.7 per cent of expenditure for electricity, 8.6 per cent for water and even 18 per cent for gas. In total, we were able to save more than

\$528,000 in the year of the earthquake. Looking at the data on power consumption in the hospital, we found that it was markedly suppressed after the earthquake.

Discussion

Our experience revealed that natural disasters have a wide range of impacts on hospital utilities as well as patients and healthcare staff. Direct impact includes human injury and damage of buildings.

Our hospital is located at approximately 375 kilometres from the epicentre of the Great East Japan Earthquake of 2011, in the northern part of the country.

Because of the location, direct damage to property was limited in our hospital.

Therefore, our experience in a moderately remote area is likely to have been different from those in areas close to the epicentre. On the other hand, the indirect impact was associated with universal issues.

These included damage to utilities such as stopping electricity and water supply, which led to long-term disruption to healthcare services.¹

The overall impact of the disaster appeared to cause more serious problems to utilities than to medical devices and instruments. Patient safety involves various types of risk related to hospital facilities. These may all occur at any time, in particular during a disaster. A lot of practices are needed to mitigate disasters in hospitals, and special knowledge and detailed information on hospital facilities and technology are required. In all these approaches, the HE is an important staff member in clinical settings because he/she is familiar with the hospital facilities related to healthcare technology² (see Fig 2).

According to the regulations, the Japanese clinical engineer (CE) manages life-support medical equipment,

such as ventilators, hemodialysis equipment, heart-lung machines, pacemakers and defibrillators. One of the most important considerations is that all these require electricity. CEs care for patients through medical equipment, but not hospital facilities.

This brings us to a new type of professional other than the CE, i.e., the HE. In my view, the HE focuses more on hospital equipment or facilities than does the current CE, who is more in charge of medical instruments rather than hospital facilities.

Although the HE is registered by a public association, he/she fits this position and should play all the more important roles in the mitigation of natural disasters as well as their management. They may also be an important member of the infection control team because hospital utilities are more important in pandemic circumstances to maintain air-conditioning and sterilisation of medical devices.

Conclusion

We have reviewed many practices to mitigate disaster in a hospital in recent disasters. From this experience, we realised that HEs provided an advantage in preventing damage, using their knowledge of healthcare technology, in particular, utilities in the hospital. Needless to say, the CE is an important staff member.

His/her knowledge, however, does not necessarily cover all the issues related to the hospital building or structure. In conclusion, the HE covers management of a broad range of hospital utilities, and should play an important role as a safety officer in a disaster.

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IoT IN THE MANAGEMENT OF AIRBORNE INFECTION

Lance Roy and Francis Tekweme
University of Johannesburg

Lance Roy and Francis Tekweme of the University of Johannesburg reveal the results of a study into how a SCADA system and the internet of medical things (IoMT) can be used to improve the overall management of hospital infrastructure.

The COVID-19 pandemic brought with it a host of challenges and obstacles. The increased burden on the healthcare system meant innovative methods of dealing with these challenges and managing the human resource component that was adversely diminished by the high incidence of infection among healthcare workers. Management of health infrastructure is a pivotal factor in maintaining a high uptime of hospitals and health infrastructure.

The internet of things (IoT) and in particular the internet of medical things (IoMT) are becoming an industry standard for peripheral devices and other medical equipment. Supervisory control and data acquisition systems (SCADA) and IoT technology have been used to manage health infrastructure and improve the performance of health care systems. The development of a smart system, which allows for remote configuration of HVAC systems, medical gas systems and TCPs (theatre control panels) and supporting infrastructure, have provided an innovative option to risk management.

The healthcare environment is driven by a conglomerate of equipment working independently or in unison to achieve to common goal of favourable and efficient outcomes to patients. The purpose of an IoMT monitoring and control system is to achieve this purpose efficiently and synchronously.

System description

Hospital infrastructure is retrofitted with sensors to measure, temperature, pressure, humidity, CO₂, air quality and other functional parameters. Critical alarms, namely HVAC plant infrastructure, medical gases, UPS (uninterruptible power supplies), generators and critical distribution boards are some of the equipment measured using IoT-capable infrastructure.

Various dashboards were created not only to analyse the performance of infrastructure in real time but also manage critical thresholds relative to each unique situation. Examples of these include maintaining negative pressure and sterile environments in the midst of load-shedding, dealing with oxygen restrictions, managing upgrades to infrastructure to accommodate more patients requiring isolation, stricter

protocols to manage the influx of patients into and out of the hospital.

HMIs (human machine interfaces) are setup in various units to ensure clusters of control as well as a point of interface between the system and healthcare workers. When possible, the preferred interface is visual and auditory as preference with touch interface as a last resort. The central control station usually located where activity of technical staff have the greatest activity.

A key benefit of an IoMT-enabled system is that a virtual platform allows reporting and diagnosis of performance and stats to be performed from anywhere. Mobile interface systems allow on the field technicians and technical staff to diagnose performance and faults on the field with access to global-view system information. PLCs (programmable logic controllers) integrated into the IoMT-enabled system, meanwhile, allow for management of predetermined scenarios these include fan failure, door failures, compromised sterility in CSSD (central sterile services department) equipment and theatre control systems.

Integration of the fault logging database with short message services such as WhatsApp and email have proven useful in managing escalation and specifically content control during resource shortages. Customisable GUIs (graphic user interfaces) allow one to address the issue of different end-users requiring different levels of information, while technical staff may appreciate the average performance of a system, the current efficiency and the average cycle time of the autoclave.

ICU staff may only be interested in knowing that the electrical reticulation system is healthy and that the sterility and airchange ratio of the ICU and isolation wards is maintained. The value-adding proposition of smart control system is its ability to simulate the decision making and logic capabilities of an experienced hospital engineer, to achieve this we have imbedded various scenarios and the most appropriate infrastructure responses to these criteria.

Figure 1 is a high-level schematic illustrating four GUIs used to manage theatre complex engineering control systems,



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general alarms in an emergency department, and 12 isolation rooms. The degree of information displayed is varied by the interface on the HMI but the level of process monitoring, escalation of alarms and control loop feedback processed by

the system is managed and communicated through an IoT-enabled platform.

The ability to remotely log in, compare the performance and benchmarking of the various platforms and systems

proved useful in comparing the systems against each other and evaluating the actual value proposition of an IoT-enabled system against a historic system. In the South African context, the oxygen shortage and sporadic load-shedding provided a proving ground for the system.

Opportunities and system upgrades

The AI (artificial intelligence) processing model is completed through interconnected satellite computer processing units communicating between various sites. The various AI models are developed and shared to the field processors. Field processors and field logic controllers are connected to peripheral sensors and actuators that provide input and output to the various sensors.

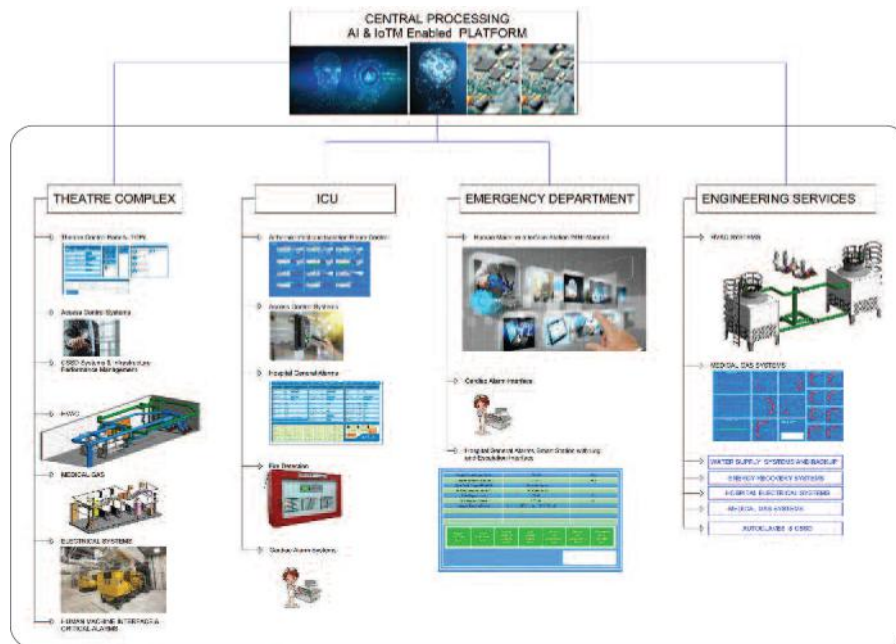


Figure 1. The typical layout of HMI and IoT-enabled systems.

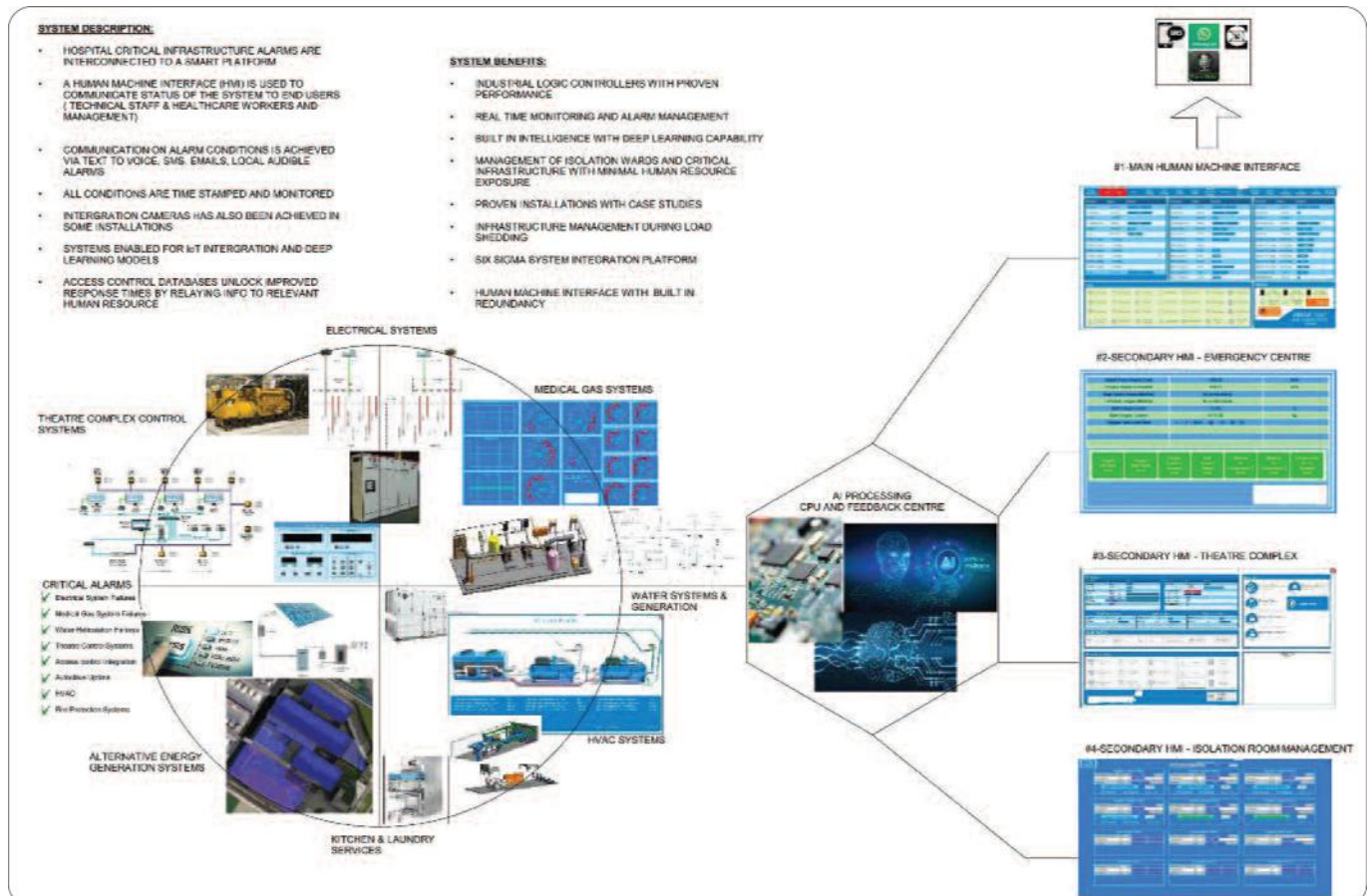


Figure 2. Smart critical alarms.

The data gathered from the various systems has shown that opportunity does exist for heat recovery and resource recycling systems. The upgraded version of the system focusses on managing alarms and risk conditions but also energy and resource recovery systems.

Successful implementations of IoT in healthcare

IoT has been successfully used to drop emergency unit waiting time. This concept was proven at Mount Sinai Medical Centre in New York City, USA. GE Health has implemented IoT-driven software to track the occupancy of beds.¹

Researchers have spent some time evaluating the ethical matters around smart cities, smart hospitals and IoT the conclusion that data from IoT and AI should be managed with the same professionalism that lawyers and medical personnel manage client and patient information. Lovasio outlined some of the information already available regarding the blueprint of our personal lives in the paper *Digital Heritage from the Smart City and the Internet of Things*.²

Medical gas, electrical systems, and TCPs (theatre control panels), also known as surgeon's panels, have existed as independent systems running independently from hospital information systems. When one evaluates the risks of engineering system failures to the patient as well as the healthcare worker the priority of control systems is easily understood. The common risks to patients and healthcare workers have been classified as but not limited to: electrocution; loss of power during a procedure; loss of ventilation, leading to increased infection risk; loss of medical gases during a procedure; and high concentrations of anaesthetic agents.

Results and findings

Here follows the results and findings from the study.

- There was an overall decline in the number of breakdowns post- installation of an automated monitoring system.
- The reaction time to alarm – the time between occurrence of the fault and rectification of the fault condition – was improved by 40 per cent.
- Data used for predictive maintenance and system optimisation, particularly on the HVAC and medical gas system, was more reliable than with a human resource. The sampling time, accuracy, and consistency of data were more precise.

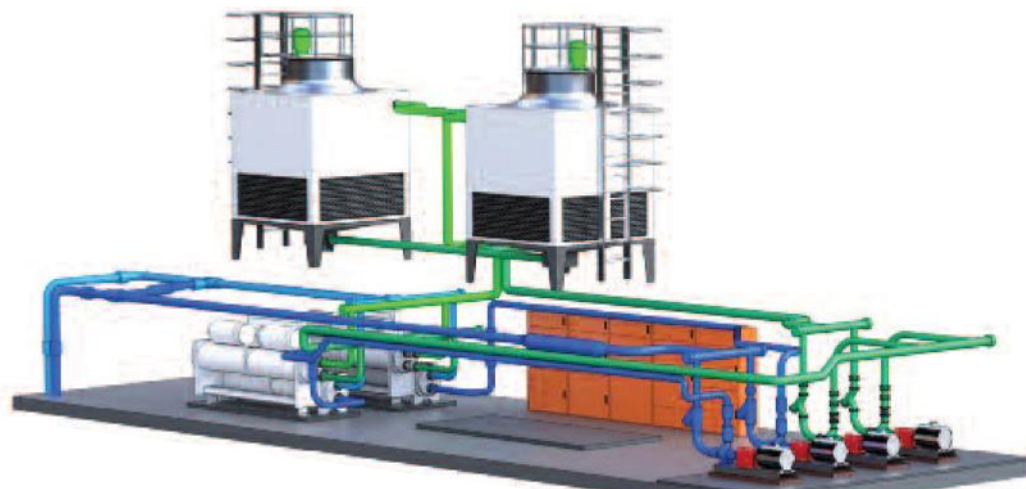


Figure 3. Chiller plant.

- There was a definite reduction in the wastage of stock from cold storage failures.
- The overall energy consumption of the plant was improved when compared watts per square metre against the same system pre-installation. This can be seen by comparing, pre-installation power curve to post installation power curve.
- In some sites, it was possible to justify the business case for heat recovery systems as the data stored on by the CPU (central processing unit) provided scientific data that could be used to prove a business case and return on investment.
- Another significant result was the decrease in the failure of compressors and refrigeration plants leading to an improved cold chain. Maintaining the cold chain by reducing the system failures in refrigeration led to a reduction in wastage of stock both in the food and beverage department but also in the pharmaceutical arena.

Conclusion

This study showed that a SCADA system and IoMT can be used to improve the performance of hospital infrastructure.

A cluster of airborne infection isolation rooms, as well as a theatre complex infrastructure with an embedded, IoMT-enabled system, was used as a case study and we were able to reduce the exposure of a human resource to an infectious environment by substituting the human sensory and tactile ability with an automated system for remote plant diagnosis and management.

The changeover of a room from positive to negative pressure could also be done remotely, which then frees up human resources. The ability to diagnose a system failure remotely or locally with a global view of the hospital and system proved to be a time-saving system ability.

The study also provided valuable information and data, which was used to fine-tune the plant and improve overall

performance and energy consumption. We were able to compare electrical data gathered from various power analysers and loggers. Data from this study was also used to better understand the realistic uninterruptible power requirements and draw a comparison against the calculated data.

We were also able to use Raspberry Pi and Arduino open-source hardware to substitute otherwise expensive controllers and provide a cost-effective solution to local alarms and non-critical control. The PLC was also able to assist in the management of a backup system for fan failure and door control in the clustered isolation rooms. This back-up system provided an N+1 design solution that further protected healthcare workers and visitors in the event of fan failure in airborne infection isolation rooms. IFHE

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Lance serves on the national team of the South African Federation of Hospital Engineers. Lance has spent the last decade responsible for the design, fabrication and project management of healthcare infrastructure in ICUs, theatres and the commercial sector. He is responsible for control systems, HVAC, gas for health and commercial systems.

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HUR AUSTRALIA

FROM MODEST BEGINNINGS IN 2001 AT FRANKSTON HOSPITAL, MELBOURNE, ADIABATIC FLUID COOLING HAS BECOME A MAINSTREAM PRODUCT IN MOST COMMERCIAL AND INDUSTRIAL MARKETS.

This has been driven by greater energy efficiency, reduced water consumption, significantly reduced health and safety risks (Legionnaires disease), no chemical treatment, and concerns about better environmental outcomes.

Events such as Australia's largest Legionnaires outbreaks at the Melbourne Aquarium, followed by years of severe drought, (where serious questions were being asked about the sustainability of potable water being used to flush through cooling

towers), led to Victoria becoming the world leader in Adiabatic Cooling Technology.

Then why are there still a large number of cooling towers in existence?

The early rollout encountered limiting factors such as footprint and cost; also many of the early adiabatic units were basic, and in some cases under designed. Often, retrofitting an adiabatic system was problematic because existing sites were

constrained by footprint when changing from an open to a closed system. In more recent times, with the expansion of new hospitals and hospital upgrades, adiabatics are often incorporated into the original design brief. Additionally, adiabatics were promoted as "low maintenance" (no water treatment/ compliance costs), however, this was often interpreted as "no maintenance". The reality is that adiabatics dramatically reduce maintenance costs, however, they do require minimal maintenance

So what are the lessons learnt along the adiabatics journey?

One of the biggest lessons revolves around a general lack of understanding regarding maintenance of adiabatic systems. Where cooling towers are generally well maintained because of the strict requirements designed to try to manage the potential health risks – particularly in health settings, this is not the case for adiabatic systems – it has often been "set and forget". Although maintenance of adiabatics is minimal, manufacturer service requirements need to be strictly adhered to. Many of the leading adiabatic manufacturers offer service contracts and extended warranty; this should always be seriously considered.

What are the new developments 20 years on...?

From the early days of adiabatics, many of the newer designed units are literally light years ahead of previous designs

- V block heat exchanger coils with optimised air distribution (no moisture carry-over)
- Highly efficient/low noise EC fans
- Verifiable performance data
- Optional stainless steel casing and frame
- External sumps and adiabatic systems (ease of maintenance)
- Marine grade extruded Aluminium adiabatic precooling components
- High level communications
- Internet enabled visibility

With a continued focus on health and environmental issues, coupled with the technological advancements, new generation adiabatic systems will continue to be a viable option in large scale health facilities.



Frankston Hospital – 2001, the launch of Adiabatic Technology



2023 New generation large scale adiabatic fluid cooler

ALTRO INTRODUCES SUPREMA: SAFETY FLOORING THAT COMBINES STYLE, DURABILITY AND EASY CLEANING

Altro, the leading provider of safety floors and wall protection, is proud to introduce Suprema – a revolutionary new safety flooring that looks good, feels smooth and is exceptionally easy to clean.

Delivers exceptional performance

Suprema is ideal for healthcare, offering unbeatable protection against slips, with a guaranteed sustainable P3 slip rating for its lifespan. Backed by a 10-year warranty, this stylish flooring remains resilient in even the toughest environments.

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Cleaning Suprema is simple and quick. Featuring Altro EasyClean technology, Suprema offers unmatched resistance to chemicals, abrasions, scuffing and stains – including proven resistance to iodine and betadine.

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Suprema's 33 colours were inspired by current trends, making Suprema an easy choice to complement an existing space or make an impact in a new area.

Its ability to perform under harsh conditions makes it ideal for high-traffic spaces including hospital wards, treatment rooms, corridors, entrances and communal spaces.

And its unique combination of safety, cleanability and style ensures that Suprema stands out from the crowd when it comes to safety flooring solutions for healthcare.

See for yourself. Order your launch sample pack at <https://form.jotform.com/230638808975874>.



NEW STATE-OF-THE-ART FACTORY

Holyoake by Price is excited to announce the opening of a state-of-the-art factory in Sydney in Q3 2023

The new facility will manufacture the Price Critical Environments range of products, allowing the company to deliver innovative, world-class products manufactured specifically for the Australian market.

With over 70 years of experience in the industry, Price Industries has established itself as a leader in the design and manufacturing of critical environment solutions. The new factory in Sydney will allow the company to bring its' expertise and quality directly to the Australian market like never before.

One of the innovative products that Holyoake by Price will be manufacturing in the new facility is the Ultrasuite, a unique customisable operating room air distribution and lighting solution.

High-output LED lighting combined with precision equalized laminar airflow eliminates the traditional "light ring" and opens valuable ceiling space for surgical equipment, while optimizing contaminant removal from the surgical zone.

With the opening of the new factory Holyoake by Price is committed to providing a new level of service and support for its' Australian customers. The company's experienced team of engineers and technicians will be on hand to provide expert advice, support and training to ensure that customers get the most out of their critical environment solutions.

Faster lead times and innovative, world class products along with excellent service and expert support will make Holyoake by Price the number one choice for critical environment solutions in Australia.

A COMPLIANT WORKPLACE IS A SAFE WORKPLACE...

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LinkSafe is the 'go to' service provider due to their expertise and deep knowledge of contractor management within the health care sector.

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- Capture permit documentation
- Track compliance, time and attendance.

Keep on top of regulatory and legislative changes; have visibility of their contractor compliance; limit access to contractors who are non-compliant; and receive and create registrations through LinkSafe's dashboard.

LinkSafe's contractor management solution is the solution for companies serious about compliance and safety.

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WELCOME TO BEWELL

BeWell, the ultimate health and wellness club designed to help you extend your healthspan and lifespan. We believe that with the right lifestyle, you can achieve health and wellbeing that extends your years of healthy living, and quality of life. We know that aging is inevitable, but we also know that with the right lifestyle, we can slow down, halt, and even reverse our biological clock.

We believe that strength training is an important part of healthy aging. The health benefits of muscle physiology play a crucial role in the management of aging and chronic diseases. That's why we offer a wide range of equipment through our "Strong, Fit and Well" program.

We are proud to offer our members access to HUR strength training equipment, which has proven to be incredibly effective and easy to use. Our members consistently praise the equipment for its ability to help them gain strength and muscle mass, improve balance and flexibility, and overall enhance their well-being.

One of the things we love most about HUR is its Smart Touch system, which makes it incredibly easy for our members to use the equipment. With just a touch of their membership card, the machines automatically adjust to their individual settings and show them exactly what they need to do to get the most out of their workout. It's a seamless and intuitive experience that keeps our members coming back for more. The equipment is not only effective and easy to use, but it also aligns with our mission to help people live younger, longer, better lives. We highly recommend HUR strength training equipment to anyone looking to take their fitness to the next level.

Since our opening in 2022, our clientele has grown rapidly, and the feedback from our members verifies the vision of our co-founders. Our users praise the beautiful, calm cutting-edge space that offers an array of services using great equipment under one roof. Within a short

span of time, people have brought strength, balance, and energy to their lives. As one member said, BeWell is a life changer.

For more information about BeWell visit <https://bewell.com.au/>



ZIP HYDROTAP ULTRACARE

Zip HydroTap UltraCare uses a multi-barrier system for the prevention and control of Legionella* and other waterborne bacteria.

Designed for health and aged care customer needs, Zip HydroTap UltraCare is powered by G5 technology and is available with Touch-Free Wave, a 100% contactless solution to instantly dispense pure-tasting drinking water with a simple wave of a hand.

Zip HydroTap UltraCare uses a combination of localised treatments and barriers that are proven as the most effective method of reducing waterborne organisms and pathogens including Legionella**.

The barriers provided in the UltraCare system are:

- MicroPurity™ 0.2-micron carbon-free filtration
- SteriTouch® antimicrobial enhanced surfaces
- MicroPurity™ UV-C LED disinfection
- Lifecycle maintenance plan
- Zip HydroCare Gold+

Innovative MicroPurity filtration is used in Genuine Zip filters to deliver an unrivalled drinking water experience. Our filters are NSF and Watermark certified to reduce the most common contaminants, including the ones you can't see, smell or taste. Non-genuine filters may not deliver the health benefits that our customers expect from genuine Zip filters. Zip Water recommends the use of genuine filters as they are guaranteed to be certified.



*ALS Pty Ltd Testing of the Zip HydroTap UltraCare system efficacy tests

**enHealth 2015 Guidelines for Legionella control in the operation and maintenance of water distribution systems in health and aged care facilities, Australian Government, Canberra.

Visit www.zipwater.com/products/hydrotap-range

FULL STEAM AHEAD

“A Healthcare Sustainability Outlook”

In previous editions we discussed topics of thermal efficiency and the fact steam remains relevant in hospital infrastructure (refer to Vol 43 & 44) due to its unique heat carrying properties. The continuing debate remains around the source of its generation (i.e traditional carbon emitting fuels) and what alternatives will be available in the short to medium future against other alternatives. So let's explore this a little more:

What do we know now:

On the eve of the most recent release from the IPCC (1), unequivocally proving that human influence has already created, centuries long irreversible changes to our natural environment, further pressure adds to healthcare facilities to play their part. Adding to this, Australia is considered as one of the top emitter's per-capita (2) with the health sector estimated to contribute around 5% of the country's total emissions.

The Australian government announced in 2015 that by 2030, they expect to reduce greenhouse emissions to 26-28% below 2005 levels. Unfortunately, Australia remains well behind the 2020 projected targets being noted as an insufficient contributor (3) on a global stage with 75% of the electricity grid still generated by coal fired power (4). Whilst it's expected that some reliance on traditional power stations would continue, there remains a lack in confidence that the Australian power network will achieve close to a renewable position in the near future, especially with non-committals to global reduction agreements and planning.

Further reference can be gained via the healthcare engineering roadmap released in the UK (5) where one consideration is for those with steam plants in very poor condition servicing minimal non-critical applications, to be removed as part of a wider de-carbonation program. However this report further identifies the continuing need for steam in hospitals, certainly those with high thermal loads and outlines many areas to improve thermal efficiency in existing infrastructure. This can start with a steam plant thermal audit with review of distribution efficiency along with potential energy

recovery opportunities to reduce OR offset fuel usage initially. Further to this, additional opportunities exist around boiler tuning with advanced controls and generating LTHW or domestic water on demand via efficient heat exchange as other enablers for energy reduction.

So what's the future look like?

CHP (Combined Heat and Power) and renewable off sets can combine to reduce energy intensity along with hydrogen energy systems or green hydrogen fuels advancing quickly. If steam generating fuels can become carbon neutral OR renewable offsets considered in the process of steam generation, combining with an efficient steam distribution system, then the major thermal needs of a hospital can be met in a net zero fashion. This future is real and a more likely realisation than Australia's power network becoming vastly renewable before a major call for action on climate change.

Putting faith in advancing clean fuels along with existing technology, provides for a sustainable outlook whilst supporting the thermal needs of a hospital. Steam continues to provide a versatile heating medium for the likes of sterilisation and critical air streams without interruption or large infrastructure modifications. Spirax Sarco is already advancing new technology into field trials so becomes a period of “watch this space” as Healthcare sustainability for the longer term, remains a priority for all involved. Get in contact with a Spirax Healthcare engineer to discuss what can be done now on your sustainability pathway.

- (1) IPCC, 2021: Climate Change 2021: The Physical Science Basis. (2) Healthcare without Harm – Climate smart green paper Sep2019
- (3) Climate Analytics & NewClimate Institute 2021, Climate Action Tracker (4) Merched 2015, Toward sustainable energy usage – A case study for Australia
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