From the Editor
(articles and responses are definitely encouraged)

G'day IIEA'ers and thanks to all contributors.

The 60th IIEA AGM has just past with many several firsts.
First time the AGM was available to all members of the IIEA via ZOOM.
First time members from all divisions including overseas members attended.
There were 25 attendees, which was a far larger attendance from previous years.
The ZOOM format allowed for all members to be seen and to participate in the proceedings.
The meeting went off exceptionally well.
We welcomed in 3 new federal councillors.
Michael Morrow from Queensland
Prabhu Subbiah Ramdoss from NSW and
Cameron Mackenzie from WA.
I am sure these new councillors will be active and I wish them all the best. DK

FROM THE PRESIDENT
It was great all the members at the recent AGM via ZOOM. In future the IIEA will be holding AGM's in a hybrid format with face to face(F2F) as well as via ZOOM. This will allow for all members to participate.
Year 2019/20 was a building year where we needed to sort out the management of members with Engineers Australia(EA), as well as the relationship with EA. A DRAFT memorandum of understanding(MoU)

has been submitted to EA for their input.
The financial management has been upgraded to all electronic. Members can now pay via credit card or Pay Anyone(cheques still accepted). Webpage is updated.
A centralised data management system(Google Drive) has been setup for storage of IIEA documents. Any member with documents for the period 2014 to 2018 inclusive, please pass onto me.
We welcome 15 new members over the year and 2 of them are now federal councillors.
We also were active with the introduction of Industrial Engineering degrees at Curtin University and University of Melbourne.
There were several ZOOM meeting events attended by members of all divisions.
All this of course under the restrictions of Covid-19.
Year 2020/21 will continue with the promotion of Industrial Engineering(IE) with the various universities as well as with industry.
In this light, I was invited to make a presentation to Curtin University at their recent

Industrial and Systems Engineering(I&SE) students evening. Hopefully will get some new student members. The evening went well but it was evident that industry is definitely not aware of IE in WA.
The IIEA will be undertaking a promotion program to contact industry in the various divisions high lighting the benefits of IE to organisations.
Another initiative that the IIEA will following is an active program of events. The plan is to have at least one event per month online, hosted by all the divisions. All the best for year 2020/21.

David Karr(FIIEA, CP Eng) Fed Pres Oct 20

MEMBERSHIP

Over the 2019/20, the IIEA welcomed 15 new members. Two of these members are also active on the federal council as well.

Matthew Astell	QLD	Student
Ofir Birenbaum	NSW	Member
Sindy Bororquez Camacho	QLD	Graduate
Ashish Dsilva	NSW	Member
David Hansen	NSW	Member
Majid Jamili Shabestari	WA	Member
Hugo(Pit Yan) Li(PY)	O/S	Member
Wen Li-W	VIC	Member
Cameron MacKenzie	WA	Member
Adnan Nasim	NSW	Member
Pawel Podsiadlo	WA	Member
Yesid Ramirez Pena	QLD	Member
Jo Staines	VIC	Member
Joshua Turner	WA	Member
Gustavo Yong Adasme	WA	Member

We have 3 new members on the federal council
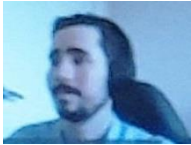
Cameron Mackenzie as Federal and Company Secretary. Cam works for Woodside Energy as a Logistics Analyst.

Michael Morrow-Councillor and Promotions. Michael has own consultancy specialising in Lean Management

Prabhu Subbiah Ramdoss as Treasurer. Prabhu I BEng Mech and Master's Degree in IE. He has13 years of Manufacturing and Industrial Engineering experience in various functions in various countries.

An education subcommittee was also created with members from academia.
Assoc Prof Pawel Podsiadlo-Curtin University
Assoc Prof Jo Staines-University of Melbourne
Dr. Abdul Mazid-CQ University Melbourne
Bob Watson(FIIEA) and David Karr(CP Eng, FIIEA)

David Karr-Membership Director

2020/21 PROGRAM

The 2020/21 program will expand on the activities of 2019/20 and will include the very successful use of Webinars.
The program will include divisional onsite visits(once covid-19) restrictions are lifted.
Industry and IE training presentations will be delivered.
It is also hoped to have joint events with Engineers Australia(EA) divisions and the Royal Aeronautical Society(RAeS).
Suggestions for topics and site visits should be sent to Michael Morrow
(michael_morrow@bigpond.com)
There will also be social events/training sessions with the idea of getting as many members active with the organisation.
Keep you posted.

INDUSTRIAL ENGINEERING CHALLENGES

1. Reengineering health-care delivery.
2. Creating a technology-oriented culture, with an emphasis on education.
3. Engineering a sustainable society by 2100.
4. Developing better decision-making tools in a dynamic world.
5. Mitigating and responding to disasters.
6. Point-of-use manufacture (to enable mass customization).
7. Infrastructure construction.
8. Safe, available and affordable food and water.

(Refer:https://engineered.typepad.com/thoughts_on_business_engi/2008/04/grand-challenge.html)

IE HUMOUR
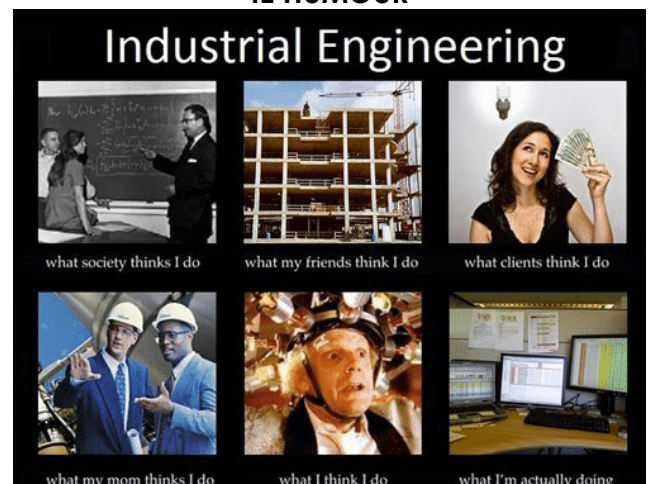
WORKING AT HOME DURING COVID-19 – EXPERIENCES AND LEARNINGS AT TELSTRA

Daniel Kulawiec(FIIEA)

In the June 2020 IIEA Newsletter, the Editor David Karr presented an article "Opportunities for IEs Post COVID-19" in which he discussed the revolution taking place across many industries as a result of the COVID-19 pandemic. David surmised that the move of many workforces to working at home (WAH) will provide the trigger for this revolution, and also spark an innovation in work practices. For Telstra, as Australia's largest telecommunication company, this phenomenon is already evident. Not only have telecommunication services and infrastructure been stretched by the shift of vast workforces to WAH, Telstra's own workforce has been leading this trend. In this article I have captured some observations from the Telstra experience.

WAH was not new to Telstra staff and contractors. For the last six years Telstra has had an All Roles Flex policy "which was adopted to create a culture that embraces flexibility and allowing everyone to bring their whole selves to work". Flexible working meant a range of things to different people, but included working remotely, job sharing or modifying regular office hours. Technology and connectivity was provided to all staff and contractors. The culture was promoted where people are empowered to manage their roles on their own accord.

As a result, Telstra was well positioned to move (almost) seamlessly to WAH at a mass scale. Previously most of the workforce would have worked one or more days a week from home. However on the 16th March, the company made the decision to move the entire 25,000 Australian workforce to a permanent WAH arrangement. The reason was to avoid the "stop-start" disruptive experience that could occur if the decision was more gradual.

The initial focus at this time for Telstra was to ensure that staff that couldn't WAH were able to continue to operate safely. This included Health and Safety procedures for the field technicians that are required to work on the network, and at customer's Premises. Also certain call centre and front-of-house retail store staff, that required to be present on site, had the necessary PPE and controls in place.

For WAH staff, the basics need to be in place for staff to feel comfortable, to be effective, and promote a sense of "business-as-usual". As Industrial Engineers, our thoughts may be on the workstation at home, and how to ensure productivity of staff are maintained while not introducing new risks. For the home-office all staff were required to complete a "Working from home checklist". Procedures for purchasing equipment like a monitor, keyboard, mouse, laptop stand, chair or a desk were established. Digital tools, access to fast-speed internet, technical support and resources were also important. And the less tangible items – security (personal and cyber), health and safety in the home environment, insurance arrangements. Although many of these matters had been previously determined, once WAH shifted from being an option to mandatory, a new level of risk needed to be considered.

It was quickly realised that one of the primary risks for Telstra's WAH workforce was the threat to mental health and wellbeing. Very quickly it became the norm to have "check-in" meetings with teams – start-of-day catch up, coffee chats, virtual Friday drinks, etc. It was all about asking each other how we are in meetings – and actually stopping and listening to the answer. The simple question "How are you" is important – it allows the team to detect whether a person's behaviours, attitudes or responses have shifted from the norm, possibly indicating a more significant underlying concern.

Telstra has always made available a third-party service for employees to (confidentialy) consult with if concerns arose. During the pandemic these services were increased and well promoted. New leave provisions were instituted to cover pandemic and isolation scenarios. Training resources were made available, with a specific focus on providing regular online sessions to team leaders on managing staff through this sensitive period. Lack of information at a time of disaster, such as COVID was, can be very distressing for people, and impact on their ability to perform. One of the most powerful tools Telstra employed was a twice-weekly "All Hands" call. This would consist of short livestreams from senior executives (including the CEO and Head of HR) as well as from different Business Units, to provide a regular and consistent information flow through the organization

during this period. It became a common source of information and sharing that the entire company could rally around. By opening up communication channels wider than ever before allowed Telstra to in fact improve its employee engagement results during this sensitive time.

One thing that is very difficult to manage is the inevitable interruption from family. Whether it be home-schooling or the fighting over band-width, these disruptions can impact the workday. Many staff would observe that these disruptions are more than made up for by the extra time spent at the workstation that may otherwise have been consumed in the daily commute. The trick is helping staff to remain productive without working extended hours. This is something each person needs to find themselves, however the employer can provide some support and guidance.

But this isn't all negative. In his blog "The future of the workplace post-COVID-19 – the new normal isn't coming, it's here now" (31/08/2020), Andy Penn, CEO of Telstra, observed that "The usual shields of business – the clothes, the offices, the hierarchies that we sometimes hide behind – have been stripped away". This has become the "great equalizer". When all staff, no matter level or role, have done away with the symbols of hierarchy, when we can observe everyone's home / partners / families / pets, suddenly the organization feels a lot closer. And a lot more human. Is there some way of maintaining this new insight when the pandemic has past?

So what will the new normal – post COVID-19 – look like? Based on staff surveys, the best prediction is that staff will find their own balance between office and home work. Some staff prefer an office environment, while many people have embraced the benefits of WAH. The office environment has its advantages – having physical proximity of staff facilitates team work, innovation and employee engagement. The informal interactions allow relationships to be formed, and allows the cultural values to be shared and strengthened.

A recent employee survey showed more than 60% of our people believe they are more productive working from home and, on average, they would prefer to work from home around 3 days per week, compared to an average of 1.7 days prior to COVID.

It is believed staff will, over time, average 2 – 3 days WAH per week. The COVID-19 experience has shown that the decision for whether the future environment is office or home based is not one driven on financial or efficiency outcomes. Both environments can be made to be effective workplaces. This is about identifying the right solution for each person in our workplace. It is not a one size fits all, and our people will be empowered to choose to work in a way that best suits them.

Daniel Kulawiec(FIIE) previous Fed Pres of IIEA

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LAYOUT DESIGN PROCESS – A CASE STUDY

Michael Morrow(MIIEA)-M2Morrow Solutions

This case study, conducted approximately five years ago for a Brisbane based manufacturer, involved the use of a predetermined time system (MTM-2 – Methods-Time Measurement 2nd Level) to streamline their kitting (packing items together as one unit) process, as part of a site layout design project. The layout design process incorporated Lean Management and Industrial Engineering tools such as Value Stream Mapping, operation process charting, line balancing and activity relationship analysis.

Review of Objectives and Process Mapping

The client's layout objectives were reviewed and documented. The objectives included centralising their national warehousing capability to a new site in Brisbane in conjunction with their manufacturing facilities. A competitive advantage of the Client is the ability to provide kits to their customers and a requirement of the new layout was to incorporate a streamlined kitting process utilising "One Piece Flow" and 5S housekeeping principles. To develop a streamlined kitting process, MTM-2 was planned to be used to analyse and optimise the warehouse picking and kitting process.

A Layout Project Team was formed, including key staff in the layout development process. A Value Stream Mapping (VSM) process was conducted for the client's manufacturing and warehousing process, with proposed changes, such as a kitting cell and kanbans incorporated into the Future State VSM (refer to Figure 1).

Figure 1. VSM –Future State

In conjunction with experienced warehouse staff, an indepth process mapping analysis of the warehouse picking and kitting process was conducted utilising the operation process charting method (refer to Figure 2).

The operation process charts identified the process elements of the picking process and the kitting process for the various products manufactured by the client. These process elements were analysed in detail during the MTM-2 Analysis.

Figure 2. Operation Process Chart Example

MTM-2 Analysis of Warehouse Picking & Kitting

The warehouse picking and kitting processes were video recorded and analysed using MTM-2. MTM-2 focuses on the motions used by operators to conduct tasks. The video analysis involved breaking down the processes into the elements identified in the operation process charting process. Each of these elements were broken down further into "data blocks". An MTM motion analysis was conducted for each of the data blocks, each with calculated process times (refer to Figure 3).

Figure 3. MTM-2 Motion Analysis Example

An important aspect of the modular approach of MTM-2 is that data blocks are generally repeated in different processes, saving analysis time compared to the traditional time study approach. The MTM-2 motion analyses were summarised in a data block Summary document (Refer to Figure 4).

Figure 4. Data Block Summary Example

Kitting Layout Optimisation

As identified in the layout objectives, the layout of the Kitting area was redesigned, utilising "One Piece Flow" and 5S housekeeping principles and incorporated into a "Production Cell" layout. To achieve "One Piece Flow" objectives, a line balancing analysis was conducted for each major product group that is currently kitted utilising the data blocks determined in the MTM-2 Analysis (refer to Figure 5).

Figure 5. Line Balancing Example

Based on the line balancing calculations and discussions with experienced operators, the kitting layout was drawn utilising "One-Piece Flow" and 5S principles (refer to Figure 6 for part of the Kitting Cell).

Figure 6. One Piece Flow Layout Example

Spreadsheets were developed for calculating the standard times of the revised kitting processes, in addition to the warehouse picking process, incorporating the data blocks and fatigue allowances (Refer to Figure 7). The standard times were used for calculating the number of staff required for a projected increase in warehouse picking and kitting, due to the centralisation requirements of the new layout.

Figure 7. Standard Time Calculator Example

Work Centre Space Envelopes & Activity Relationship Analysis

For all work centres identified in the Value Stream Mapping process, space envelopes were developed by the Factory Layout Project Team (except for the optimised Kitting Work Centre). The space envelopes contained the space required to productively perform the task at the work centre (e.g. loading/unloading space, equipment footprints, tool storage) and were transferred to CAD (refer to Figure 8).

Figure 8. Work Centre Space Envelope Example

The Factory Layout Project Team conducted an activity relationship analysis, where each work centre was rated in terms of closeness to each and every other work centre in the layout and documented in a matrix (refer to Figure 9).

Figure 9. Activity Relationship Example

Factory Layout Development

The floor plan of the new site in CAD was obtained from the client and the work centre space envelopes were added to the floor plan, based on the workflow identified in the Value Stream Mapping process. Information from the activity relationship analysis was

applied to the layout drawing to review the optimal positioning of each work centre based on closeness relationships with adjustments made to the layout where necessary. Alternative layout options were considered and reviewed by the Layout Project Team (refer to Figures 10 to 13).
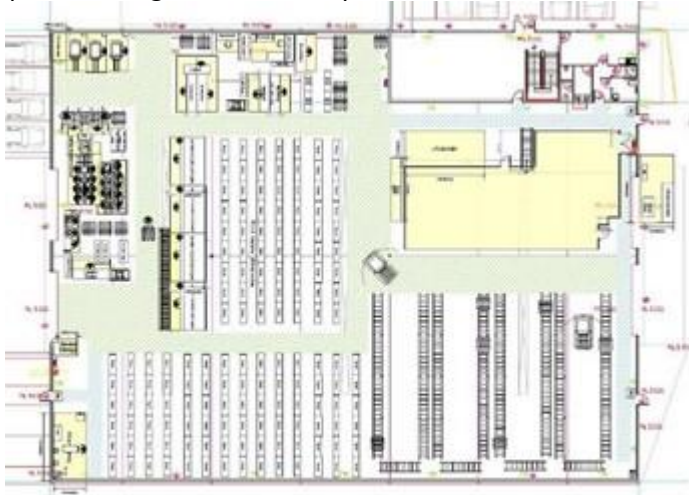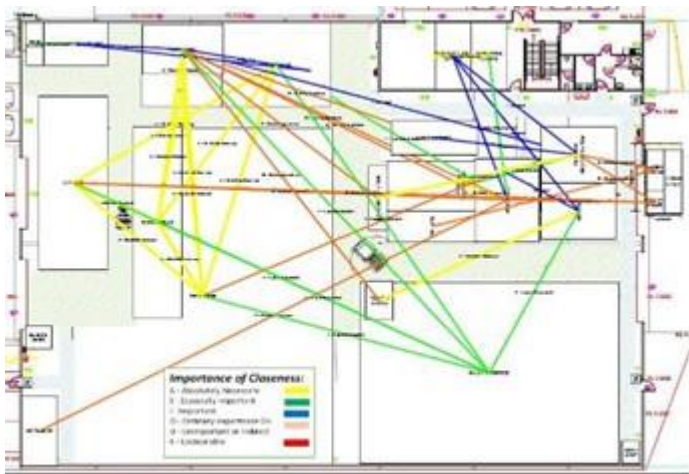

Figure 10. Conceptual Layout

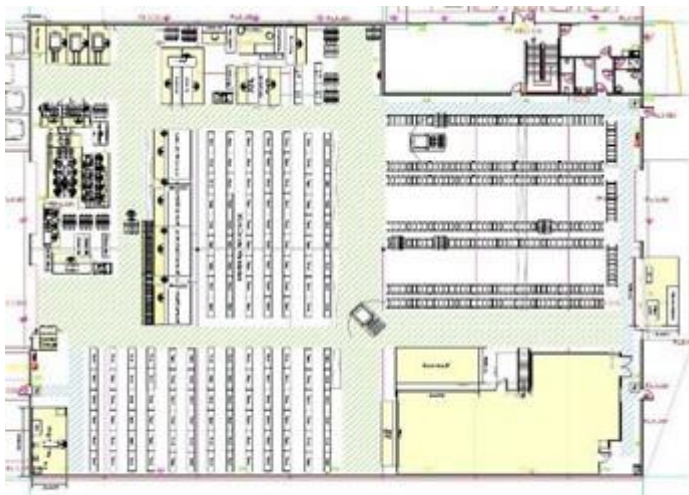Figure 11. Conceptual Layout with Activity Relationships
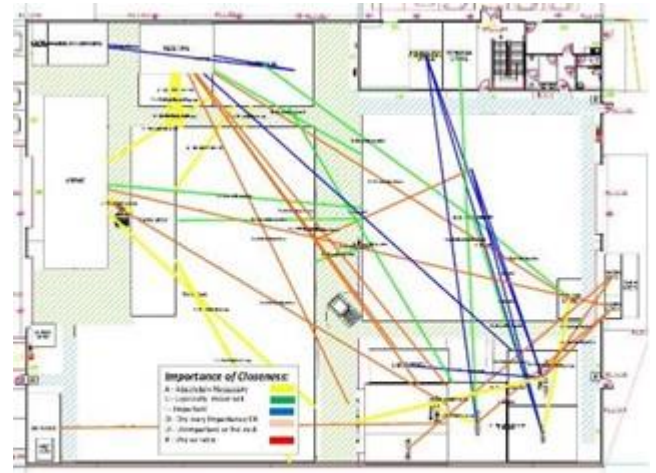

Figure 12. Conceptual Layout Alternative

Figure 13. Conceptual Layout Alternative with Activity Relationships

Michael Morrow(MIIEA)-M2Morrow Solutions
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MANGOOLA COAL SUBMISSION
provided by Wayne Feenstra(AFIIEA)

The Operation
Mangoola Open Cut is part of Glencore Coal Assets Australia and is a modern thermal coal operation in the Hunter Valley of NSW with consent authority to extract and process 13.5 million tonnes p.a..
In 2020, the operation will mine and process 10.6 million tonnes of coal for domestic and export markets.
The operation is industry leading operation in terms of safety, productivity and environmental excellence known widely for its best practice natural landform rehabilitation.
The Mangoola CHPP is a cutting edge coal beneficiation asset incorporating a state of the art train load out system dispatching rail cargo to the Port of Newcastle.
The CHPP as a department has an exceptional safety record and has not sustained a lost time injury since commencement of operations in February 2011.

The Challenge
The Asset Management team at Mangoola CHPP has developed a carefully engineered solution to the difficult task of replacing the belly plates on an ABON Chain Feeder. Typically, working space is restricted beneath the machine and the OEM's standard replacement instructions include dismantling the machine from the top down. This is a lengthy task requiring the removal of the upper floor plates, the chain and flight assembly and then removing the belly plates once all the

former components are removed. This also entails multiple crane lifts and the associated interaction of personnel in that environment. There is also the risk of the belly plates binding within the frame making it difficult to dislodge them and inviting excessive lifting equipment loads as a result.

IMPORTANT
Ensure all personnel are clear of chain feeder before proceeding.

5.11 Remove bolts securing deck to chain feeder frame.

If deck is seized manipulate as required to free it.

Lift top deck vertically and clear of chain feeder.
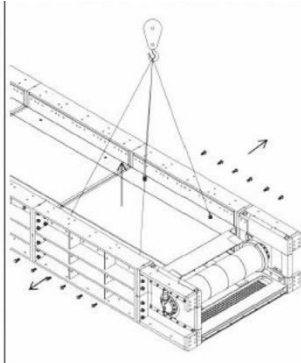
OEM prescribed methodology

General arrangement of feeder "underbelly" showing newly installed modules.

In 2016 at another operation, a maintenance worker was fatally injured in the process of performing this task on the same make of machine

The Solution and Outcome
The asset management team at Mangoola CHPP were faced with the prospect of conducting exactly the same task 2 years later. The team were instructed simply to "devise a method to remove and replace these components with the absolute certainty that no person would be injured". Over a period of about 9 months, led by CHPP Maintenance Supervisor Scott Bannerman, the team devised a method that utilises a hydraulic trolley mounted lifting table, travelling on a rail system that allows the plates to be removed, railed out and the new plates railed in and lifted squarely into position without personnel exposed to suspended loads. The task was completed without injury or incident in October 2018.
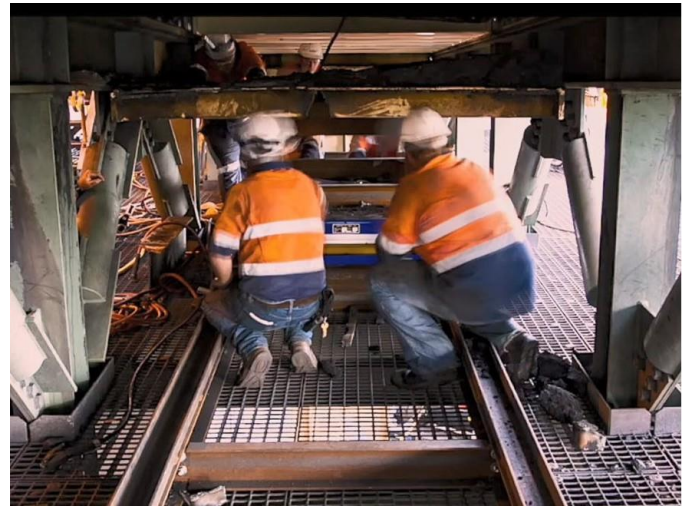
Old Plates removed and railed out using a track mounted hydraulic lifting table.
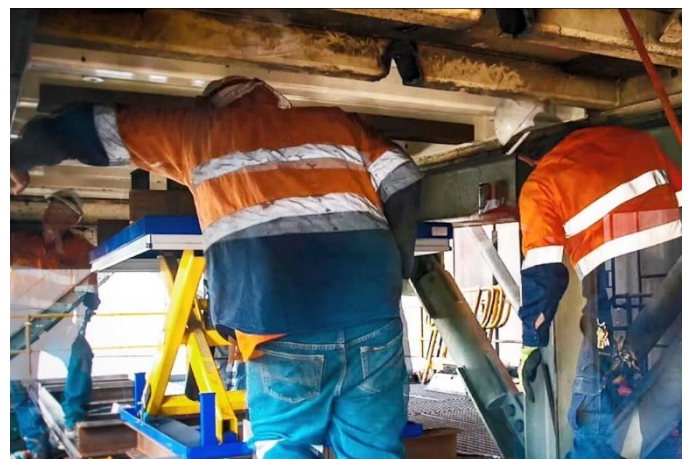
New plates railed in and raised to service position.

With the design assistance of OEM FL Smidth ABON a further improvement saw the replacement plates being manufactured at a slightly narrower profile with the addition of "shim packs" to eliminate the prospect of binding when they are required to be changed next.

A further benefit of this work method was enabling work to continue above the top deck as it remained in place as a hard barrier between the workers below. This meant that critical bin liner work could proceed with nil risk or impact to the involved work party.

Furthermore, the preparatory hot works required for this initial undertaking will not be required during the next event. In total this job took 36 hours from start to finish. With the elimination of hot works (12 hours), it is envisaged that the next event could be completed in 24 hours.

What sets this initiative apart is the diligent application of Engineering in the hierarchy of controls to deliver not only a method that eliminates the risk of serious injury but additional productivity benefits.

In 2019, at the Australian Mining Prospect Awards, Mangoola CHPP was recognised for this initiative by taking out the prestigious "Excellence in Mine Safety, OH&S" award. On the same night. Mangoola CHPP went on to receive both the "Australian Coal Mine of the Year" and "Australian Mine of the Year". These accolades are testament to the engineering excellence and professionalism of the Mangoola CHPP team in their pursuit of zero harm to all personnel.

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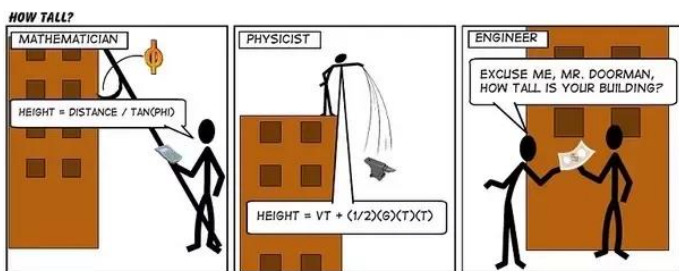
UNAMANNED AERIAL VEHICLES
David Karr(FIEEA, CPEng)

WHAT IS A UAV(Unmanned Aerial Vehicle)
A UAV commonly known as a drone(or remotely piloted aircraft) in some parts of the world, is an aircraft without a human pilot on board.

Flight is controlled either autonomously by computers in the vehicle, or under the remote control of a pilot on the ground or in another vehicle.

HISTORY
UAV's were first developed during World War I. Some were tethered and others were untethered. The original UAV's were guided by gyroscopes. Only later was radio control introduced.

Remotely controlled UAV's began to be readily used with high bandwidth data links became available during conflicts such as in Afghanistan and later in Iraq.

CONTROL
UAVs can be controlled by using various communication systems (vhf, wireless, RF, WiFi etc) with various onboard systems such as GPS, cameras, sensors, autopilot etc.
Deployed initially predominantly for military applications.
Today used in a growing number of civilian applications, such as photography, survey work, policing, and non military security work, surveillance of powerlines, search & rescue, sports events.
Small UAVs are now even being used to deliver goods.
UAVs will also replace piloted aircraft in hazardous situations such as firefighting in the near future

UAVs IN OUR SOCIETY
UAV's can be used in many aspects of our society other than for military use. This includes:-
- **Data Collection**
- Aerial Surveying/Aerial Photography
- Agricultural(crop spraying, crop survey
- Fire Surveillance and Management
- Pollution Monitoring/Scientific Research
- Policing/Event Security/Military
- Disaster Search & Rescue
- Meteorology - Storm Tracking
- Fisheries Management/Shark Patrols
- Transmission Line Inspection
- Traffic Monitoring
- Construction Site Management
- Playground Surveillance

TYPES OF UAVs
There are 4 Types of UAV recognised by CASA(Civil Aviation Safety Authority)

- Fixed Wing
- Multirotor
- Rotor
- Balloon

Please remember
Industrial Engineers MAKE IT HAPPEN