A strategy for inclusiveness, well-being and diversity in engineering workplaces

November 2014

Supporting Organisations

Workplace Gender Equality Agency

Professional Associations in Australia

Academy of Technological Sciences and Engineering

"This is an important initiative to support the retention and leadership of women in technological sciences and engineering."

Dr Margaret Hartley FTSE, Chief Executive Officer ATSE

Consult Australia - Male Champions for Change

"This breakthrough strategy provides a robust framework to make real change in diversity in our industry."

Greg Steele, Managing Director Australasia, Hyder Consulting, Chair Male Champions for Change 2012-14.

Engineers Australia

Supported by the Engineers Australia National Council, Centre for Engineering Leadership and Management and the National Committee for Women in Engineering.

Chief Executive Women

Supported by Chief Executive Women for further engagement with business leaders.

Christine Christian
President Chief Executive Women

International Professional Associations

Federation of Engineering Organisations in the Asia-Pacific

"FEIAP endorses this strategy for betterment of science and engineering fraternity."

Prof. Chuah Hean Teik
President FEIAP, 2011-2015.

International Network for Women Engineers and Scientists

"Women engineers and scientists will feel able to make important contributions to organisations implementing this strategy."

Professor Kong-Joo Lee
President, INWES, 2011-2014

World Federation of Engineering Organisations

"This strategy will support the performance and development of engineering in Australia and internationally."

Mr. Marwan Abdelhamid
President WFEO 2013-2015

FOREWORD

It is widely known that Australian women have comparably lower labour force participation rates than many OECD countries (1). Australia's maternal employment rate remains below the OECD average of 65.2% (2). Of great concern, are the lower participation rates of women in male-dominated sectors such as mining, utilities and manufacturing and the lower participation rates of women in engineering, science and technology related professions.

Although increasingly employers are investing in a wide range of programs to support gender diversity, the change has been slow. As a result, there are still far too few role models of women engineers who have had successful life-long careers, raised families and achieved positions of leadership. It's not surprising that the percentage of women studying engineering has remained low for decades. Concerningly, even fewer women remain in the profession, many not returning after bearing their children.

These losses come at a significant cost to Australia and its economy. Some of the most pressing problems facing us today — such as energy, water, and climate change have science and engineering at the heart of the solution. We need the best talent, male and female, to bring diverse perspectives to address these challenges. Diverse teams are also more innovative, which will drive Australia's future economy and wealth.

The approach to increasing gender diversity presented in this document, builds on the ideas from the Male Champions of Change 2011 report, which highlighted the importance of leadership in driving cultural change. This strategic approach with explicit support from the Chief Executive and Board has been shown to be most successful in creating the cultural change needed to make diversity programs work.

Developing gender diversity initiatives in ways analogous to workplace health and safety presents a powerful message in terms familiar to science and engineering organisations. The reporting of progress against set goals using both leading and lagging indicators is an innovation that will enable leaders to understand whether their strategies are working and if the pipeline is full of diverse leaders for the future.

This document provides a roadmap which I hope will be a game changer for the recruitment and retention of women in science, engineering and technology.

I commend the organisations supporting this profession-wide initiative and look forward to hearing about the successful implementation of this strategy in many organisations.

Elizabeth Broderick
Sex Discrimination Commissioner, Australian Human Rights Commission

A clear case for increased diversity in engineering

By any measure, engineering in Australia continues to be a male dominated profession. Even the small percentage of women who study engineering and move into the profession, are more likely to leave their jobs than men. This usually occurs at a crucial stage of their careers, which means they fail to make it into the pipeline for leadership positions. According to the 2011 census, only 51.2% of women with engineering qualifications work in engineering (3) and women represented just 11.8% of the engineering workforce. There is also a need to ensure greater participation by Australia's indigenous engineers and overseas born engineers, many do not have engineering work.

The result is a significant waste of talent and education which acts as a brake on business growth and economic productivity – an outcome Australia simply can't afford.

Addressing this challenge will take a new approach by employers that ensures all the best skills available are utilised and supported. The strategy outlined in this report is urgently needed to stem the waste of skilled talent and not just in engineering, but across sectors involving science, and technology, utilities, mining and manufacturing.

The strategy outlined has a simple aim: to ensure that organisations in these areas offer viable careers for qualified engineers, scientists or technologists, no matter what their gender, race or background. The message must be that anyone who aspires to be an engineer can have a life-long successful career, achieve their potential and make a significant contribution.

This is also a strategy for building strong and sustainable businesses. Comprehensive international research shows that diverse organisations are more innovative and profitable, and reflect the communities in which they operate. Boards and shareholders are increasingly aware that inclusive workplaces are more efficient and effective through making the most of the talents and abilities of all employees. Diversity is strongly linked to better governance, enhanced corporate financial performance, improved safety and sustainability initiatives and greater innovation.

As Australia tackles a combination of challenges including climate change, infrastructure, energy and water, engineering solutions are more crucial than ever (4). The same can be said of the economy's shift from a mining and resources base to one that is based on technology, advanced manufacturing and innovation. At the same time, the engineering workforce is ageing and needs to be replaced by both younger men and women.

The Human Rights Commission has published a letter to CEOs (5) with case studies and a structured approach to increase women's participation in their organisations, especially at leadership levels. This document builds on the principles of this strategy and outlines particular applications for engineering workplaces. These steps are designed to ensure greater diversity by addressing some of the cultural issues that are resulting in both men and women leaving the engineering workforce.

The Australian workplace – where are the women?

A wired world means the demand for technology smarts and skills from science, mathematics and a range of technology disciplines, along with plenty of ambition and drive, are at a premium. As demand grows for these qualities, which are hardly gender specific, women continue to be under-represented in these career paths and virtually invisible at the top ranks of majority engineering and technology organisations.

The failure to engage and retain women and foster a diverse workforce in the engineering and mining sectors has been well documented. The Census of Women in Leadership (6) lists these sectors as among the poorest ranking for women in leadership positions and boards. Less than five Australian companies in this sector were listed as Employers of Choice by the Workplace Gender Equality Agency in its 2012 report.

Although the deficit is clear in these areas, women are also under-represented across the economy. Australian women's workforce attachment ranked 10th among OECD countries in 2008 and 21st in 2010 (7). Australia was ranked first in female educational attainment out of 136 participating countries but ranked at 52 in labour force participation by The World Economic Forum Global Gender Gap Report 2013(8). Australia's overall gender gap ranking is down to 24 from 15 in 2006 (9), while many other countries have improved their rating, which also measures health and survival and political empowerment.

 An increase in female participation in the work force would have a substantial impact on the Australian economy, according to the Grattan Institute (10). A 6 per cent increase could increase GDP by $25 billion, the same level as in Canada, which provides affordable child care. While Australia is making a large investment in women's education at the primary, secondary and tertiary level, it is failing to make effective use of the skills that are delivered.

Although girls do well at school and more women are attaining higher qualifications, women have lower starting salaries and pay, lower labour force participation, fewer opportunities for workplace leadership, and less superannuation, according to the COAG Reform Council (11).

The picture at the top of ASX companies is mixed and progress to better gender balance has been slow. After significant efforts by the Australian Institute of Company Directors, 17.3% of ASX200 company boards are women(12). However 42 ASX 200 boards have no women and many women hold multiple board positions, at a higher rate than men, indicating that there are a small number of women who are considered to have the appropriate skills (13). And there are few women in the pipeline, with only 9.7% of executive management positions in ASX 200 companies held by women in 2012(14).

A snapshot of women in Australia's engineering profession

In the last two decades the numbers of engineers in Australia has fluctuated as demand reflected economic conditions. The resources boom led to a shortage of engineers and resulted in more than 70% of Australia's current engineers arriving from overseas (15). Through this period, the number of women engineers remained below 10%. At the 2011 census, there were approximately 20,400 overseas born women engineers and 10,600 who were born in Australia. About 16% of engineering students are women. But data shows a range of impediments prevent many women engineers from making the most of their skills and having sustained, senior careers in their profession.

Retention

Keeping women in engineering is a significant problem, with disproportionate numbers leaving the profession, especially in the 30-50 age group. By comparison, the number of men in engineering in this age bracket shows a slight increase, due to migration. This is a critical period in a career path when experience is consolidated and progress is often made into middle management.

It is clear that women are leaving due to family responsibilities and the lack of flexibility and appropriate support in engineering workplaces. The upshot is fewer than one thousand Australian born women aged 50 or more were in the engineering labour force at the 2011 census (16).

Progression

Women engineers are less likely than men to be engaged in management and supervisory activities and more likely to be involved in technical and design work. Very few reach leadership positions. This is reflected in the mere 176 women at the membership grade of fellow or honorary fellow in Engineers Australia at June 2014, out of some 100,000 members, compared to more than 5000 male members (17).

Pay

While graduate salaries appear to be approaching similar levels for men and women, the Engineers Australia 2012 survey (16) found that women engineers are paid lower salaries than men, irrespective of whether they work full time or part time and irrespective of age. In particular, women engineers working full time and aged between 30 and 50, earned less than male engineers.

Women in this age group were also less satisfied than men in terms of the type and variety of work, opportunities for responsibilities and promotion, opportunities to use their abilities, hours of work, staff development and training and communications and relations with management.

Motherhood penalties

The participation rate of women with families continues to be low. The fertility rate of women engineers is less than 25% the average for Australian women (18). The likelihood of women leaving the engineering workforce increases with the number of children in her family.

Work-life balance is a critical issue and has been consistently rated among the top issue for women in engineering (81.2% in the Engineers Australia 2012 survey (16), 70% by the APESMA 2007 survey (19)). Engineers Australia's 2012 survey showed that nearly 90% of employers provided some flexible work arrangements, but that the take-up of these arrangements continued to be low (16).

Toxic workplaces

Successive surveys by Engineers Australia over the past decade have shown that engineering workplaces are a harsh work environment with high rates of bullying and harassment including sexual harassment (16). 23.6% of women reported personal experience of being sexually harassed (27% in 1999 survey 22% in 2007 survey). And 35.3% of women reported discrimination in the workplace (42.3% of women in 2007 survey), more than twice the rate experienced by men (16, 18).

Discrimination increased with age with 55.4% of women aged more than 50 years reporting discrimination, more than three times the rate for men in the same age group. In the 2012 Engineers Australia survey, 31.0% (28.2% in 2007) of women reported they had experienced bullying and 39.7% reported observing it. The equivalent figures for men are 21.2% and 32.7% respectively, also unacceptably high.

A strategic approach for inclusiveness, wellbeing and diversity in engineering workplaces

Change in workplace norms is unsettling particularly when it involves a shift in the way 'things have always been done'. But delivered well, and communicated with a strong and clear reason for action, change programs can alter behaviour and attitudes effectively and quickly. Over the past two decades, the introduction of new safety practices have been remarkably successful in transforming engineering workplaces especially in the process chemical industry. The shift has been led with a commitment from the top and a strategic approach to improving safety.

Many elements of this strategy can be applied to developing more diverse and inclusive engineering workplaces. In fact, this approach is applicable to all workplaces.

The key elements include:

1. Corporate Commitment from leadership
   a. Commitment from the Chief Executive and Board with a visible policy statement

2. Corporate Enablers
   a. Practices and procedures that are mandatory not optional, supported by training and other systems

   b. An integrated system with well documented procedures and policies which form part of normal operations

   c. Management at every level assigned responsibility for implementing the policy and remunerated accordingly

3. Corporate Reporting, Monitoring and Review
   a. Ongoing monitoring and review of every work site with regular reporting to the Chief Executive and Board

   b. A set of leading and lagging indicators is reported to the Board, management and staff

   c. Regular communication to ensure awareness of the program internally and externally

VISION
VALUES

CEO POLICY STATEMENT

FRAMEWORK FOR STANDARDS,
PROCEDURE, TRAINING, REPORTING,
AND PERFORMANCE MEASUREMENT

DETAILED OPERATING INSTRUCTIONS
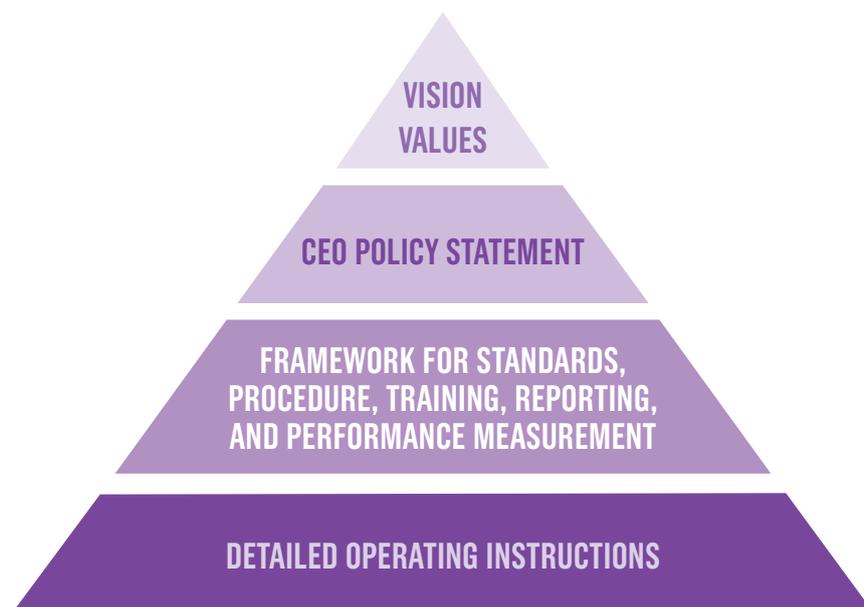
Measuring and reporting performance – the need for leading indicators

It's often said that what gets measured gets managed; and what gets rewarded gets repeated. A key element in changing the safety culture has been the monitoring of safety indicators by the Chief Executive and Board. In the same way, key metrics to track performance in achieving a more diverse culture and the embedding of incentives through key performance indicators are essential.

Key benchmarks need to be reported at appropriate levels of management to provide a highly visible message of the importance of the strategy. These metrics should report on the important elements of a diversity system and progress made in meeting each of them. Many listed and larger organisations in Australia already publish diversity policies and collect and publish data on gender representation to comply with ASX diversity recommendations and the Workplace Gender Equality Agency reporting guidelines.

As with safety, lagging indicators are a traditional reporting method and are a retrospective set of metrics that are based on events that have already occurred.

Leading indicators are forward looking, ensuring that targets for inclusiveness, wellbeing and diversity will be achieved in future and indicating weaknesses in procedures that may need additional attention. Leading indicators reduce the time lag in identifying and addressing issues and provide management with a clear picture of how an inclusive workplace culture is developing, how the strategy is being implemented, whether there are roadblocks and that shortcomings are identified and addressed. This is particularly important given the time lag to achieve change in the area of human resource management

A set of leading and lagging indicators that could be reported in an organisation's diversity system is shown in **Table 2**. A powerful incentive is the alignment of the reporting framework with the strategic approach recommended by the Workplace Gender Equality Agency to achieve Employer of Choice (20). Such recognition would provide public endorsement of progress being made to achieve diversity within the organisation

TABLE 1: STRATEGY FOR INCLUSIVENESS, WELLBEING & DIVERSITY

STEP 1	**COMMIT TO INCLUSIVESS, WELLBEING AND DIVERSITY**		
	Develop a culture of inclusiveness, wellbeing and diversity	Establish inclusivness, wellbeing and diversity as a core value by leadership in the organisation	Policy signed by CEO or Chairman of Board
	Develop performance and behaviour standards for inclusivness, wellbeing and diversity	Establish high performance and behaviour standards and zero tolerance for violations	Policies available on company intranet
	Ensure competency for managing inclusivness, wellbeing and diversity	Ensure employees have the necessary knowledge - regular training appropriuate to at each level of management	Management training for a diverse workforce
	Involve the workforce	Ensure employees take ownership and commit to inclusivness, wellbeing and diversity	Make it personal , e.g. "I want to be the best I can be", this affects my daughter, my partner, my sister ...etc
STEP 2	**UNDERSTAND INCLUSIVESS, WELLBEING AND DIVERSITY ISSUES**		
	Review inclusivness, wellbeing and diversity issues across the organistaion	Undertake comprehensive analysis of all operations and all work sites	Training for managers in operations with particular problems, e.g. Bullying and harassment
STEP 3	**ESTABLISH FRAMEWORKS FOR MANAGING INCLUSIVENESS, WELLBEING & DIVERSITY**		
	Develop formal procedures	Documented procedures, regular training, recruitment, promotion, performance appraisal	Policies available on company intranet
	Provide opportunities for flexibility	Develop policies for flexible working, job sharing etc.	Policies available on company intranet
	Contractor management	Ensure contractors are aware of relevant procedures e.g. Recruitment and training, bullying and harassment etc.	Policies available on company intranet
	Management of Change	Review impact of changes in operations, organisation structure, management personnel	Policies available on company intranet
	Operational reviews	Conduct regular reviews of operations via interview, surveys etc.	Publish results for all employees
STEP 4	**MONITOR REPORT AND REVIEW**		
	Confidential reporting	Establish systems for confidential reporting of matters relating to breaches of the policieis for inclusiveness, wellbeing and diversity	Reports to management and board
	Investigate incidents	Formal reviews of complaints and incidents and learning from these	Reports to management and board
	Report key metrics	Develop key leading and lagging indicators of performance in inclusivesness, wellbeing and diversity	Reports to management and board
	Conduct regular audits	Conduct regular audits to assess compliance with inclusiveness, wellbeing and diversity procedures	Reports to management and board
	Review activities and performance	Report results of audits, metrics and other reviews to management	Reports to management and board
STEP 5	**BOTTOM LINE IMPACT**		
	Employee turnover & satisfaction	Formal report to Board and management	Annual report
	Safety performance	Formal report to Board and management	Annual report
	Sustainability intiiatives	Formal report to Board and management	Annual report
	Profitability	Formal report to Board and management	Annual report
	Company profile and reputation	Formal report to Board and management	Annual report

TABLE 2: LEADING AND LAGGING METRICS FOR INCLUSIVENESS, WELLBEING & DIVERSITY

	Metrics for Inclusiveness Wellbeing and Diversity	Leading Metrics for Inclusiveness, Wellbeing and Diversity	Lagging Metrics for Inclusiveness, Wellbeing and Diversity	Workplace Gender Equality Agency compliance reporting indicators	Workplace Gender Equality Agency Employer of Choice indicators, 2013
1	Leadership Commitment	Reporting internally and externally on strategy and priority for inclusiveness, wellbeing and diversity	-	-	Criterion1: Leadership accountability and focus
2	Gender composition of work force	Comparison of targetted and actual levels for gender composition in the workforce including various levels of management and leadership	Percentage of male and female employees in the workforce	Gender Equality Indicator (GEI) 1: Gender Composition of Workforce	Crtierion 7: Targets for gender outcomes
3	Workplace policies - remuneration, job descriptions, recruitment, parental leave etc.	Percentage of sites in the organisation which use corporate policies on recruitment, remuneration, formal job descriptions, etc	No. of instances reported by employees where managers have failed to observe the organisation's policies regarding remuneration, leave etc.	Gender Equality Indicator (GEI) 3 & 4: Remunerations, employment terms, conditions and practices	Included in Criterion 1, 3 and 4 (Leadership, remuneration, flexible working arrangements)
4	Recruitment processes	No. of sites with recruitment procedures that do not have specific requirements to ensure inclusiveness, e.g. Interview panels have no requirement for diverse composition.	No. of times recruitment interviews do not proceed according to procedure, e.g. Interview panel is not diverse in composition.	Gender Equality Indicator (GEI) 4: Employment terms, conditions and practices	Included in Criterion 1 and 7 (Leadership and Targets for outcomes)
5	Graduate recruitment	Diversity of applications applying for graduate positions, percentage places filled by women, indigenous engineers etc.	No. of women accepting offers at the graduate level.	Gender Equality Indicator (GEI) 1: Gender Composition of Workforce	Included in Criterion 1 and 7 (Leadership and Targets for outcomes)
6	Remuneration practices	Women's remuneration as a percentage of men's at every level in the organisation and progress towards addressing the gap.	-	Gender Equality Indicator (GEI) 3: Remuneration practices	Criterion 3: Gender remuneration gap
7	Training and development	Percent of employees completing relevant training in diversity, appropriate to their role and responsibilities, planned rates of completion	No. of managers who have received appropriate training	-	Criterion 2: Learning and development
8	Staff turnover	No. of women who may be at risk of leaving the organisation and support being provided.	No. of women leaving the organisation despite receiving counselling and support for their role. No. of women leaving the organisation without any discussion with management or human resources so the reasons for departure are unknown	-	Criterion 1: Leadership accountability and focus
9	Flexible working policies	Development of flexible working policies, percentage of managers who have received training in implementation, no. of women on parental leave receiving return to work support.	No. of women working flexibly or part-time at various levels of the organisation, no. of women on parental leave, no. of women returning from parental leave.	Gender Equality Indicator (GEI) 4: Employment terms, conditions and practices	Criterion 4: Flexible working arrangements
10	Support for women in the workplace - mentoring, coaching, networking	No. of women who attended networking sessions, number of women identified as candidates for promotion to the next level.	No. of women recruited externally, no. of women promoted internally	-	Included in Criterion 2: Learning and Development
11	Numbers of women in middle management	No. of women receiving training and mentoring for future roles in middle management	No. of women starting new middle management roles, number of women in middle management who have left, total number of women in middle management.	Gender Equality Indicator (GEI) 1: Gender Composition of Workforce	Criterion 7: Targets for gender outcomes
12	Numbers of women in leadership	No. of women receiving training and mentoring for future leadership roles	No. of women starting new leadership roles, number of women leaders who have left, total number of women in leadership.	Gender Equality Indicator (GEI) 2: Gender Composition of Governing Bodies	Criterion 7: Targets for gender outcomes
13	Communication of diversity policies	Development of appropriate communication strategy on diversity initiatives	No. of internal and external communiqués regarding the organisation's commitment to diversity by the Chief Executive and senior management, external recognition of commitment to diversity e.g. Workplace Gender Equality Agency	Gender Equality Indicator (GEI) 5: Consultation with employees on gender issues	Criterion 5: Employee consultation
14	Workplace incidents - bullying, sexual harassment etc.	Observations of potential for workplace bullying and harassment - creates awareness of appropriate workplace culture and behaviours.	Reporting of numbers of complaints on workplace bullying, harassment, sexual harassment etc.	Gender Equality Indicator (GEI) 6: Other matters including sex based harassment and discrimination	Criterion 6 : preventing sex based harassment and discrimination

APPENDIX

The experience of implementing a safety culture in engineering workplaces

A significant cultural transformation has occurred in engineering workplaces in the past 25 years in the management of safety. As a result of greater awareness of the loss to property and human life from major incidents such as the Esso Longford explosion in Victoria's Gippsland in 1998, the Australian engineering industry and regulators have created an effective framework for managing safety and creating a safety culture within organisations.

The imperative for safe operations is now a part of good operating practice not just in the chemical industry but in all engineering organisations. There is now heightened awareness of safety as an important organisational value at every level of the organisation from the board, chief executive and senior management to managers, technicians, staff, operators and contractors and a safety culture is now embedded in most engineering organisations. It is part of day- to-day operations, effectively managed at every work site and performance is monitored and reported at various levels including at the Board level.

Government regulators, boards and shareholders are now aware that managing safety is critical to ensure profitable and sustainable operations and ensure employee safety. Today it would be unthinkable for a manager, contractor or anyone in a position of responsibility to flout the safety policy and safety values are re-enforced repeatedly at all levels with all employees.

Some of the elements of the safety culture (21) that have been adopted by the chemical process industries in Australia and internationally are listed in **Table A1.** This represents a systematic approach to managing safety, especially important in the chemical industry which handles large amounts of hazardous materials at high temperatures and pressures.

The systematic implementation of a safety system also involves the monitoring of progress by senior management. The industry has developed key metrics comprising leading and lagging indicators for reporting performance. These metrics are structured around the important elements of a safety system and provides management with assurance on the organisation's safety performance (22).

Lagging indicators have been the "traditional" way of reporting safety performance over several decades. They are a retrospective set of metrics that are based on near misses or incidents that have already occurred. However the reporting of occurrences such as near misses or incidents after the fact indicate failures in the various layers of protection that have allowed such incidents to occur. There is a time lag in addressing such failures.

Leading indicators are a more powerful set of metrics, they are forward looking and indicate performance of critical work as it progresses, operating discipline and observation of essential procedures. This ensures that the various layers of protection comprising hardware, software and people are all operating as designed. Leading indicators provide confidence that the organisation's safety system is suitable to operations and disclose potential system weaknesses without incurring the cost of an incident or an operational shutdown.

An example of leading and lagging indicators that would be reported in an organisation's safety system is shown in **Table A2.**

TABLE A1: SYSTEMATIC PROCESS SAFETY MANAGEMENT SYSTEM

	COMMIT TO PROCESS SAFETY		
STEP 1	Develop a Process Safety Culture	Establish safety as a core value by leadership in the organisation	Policy signed by CEO or Chairman of Board
	Develop Process Safety Standards	Establish high performance standards and zero tolerance for violations	Policies available on company intranet
	Ensure Process Safety Competency	Ensure employees have the necessary knowledge	Training in safety systems and procedures
	Involve the workforce	Ensure employees take ownership and commit to safety	Make it personal , e.g. "Please come home safe today", this affects my family - my partner, my kids, my mum and dad.. etc
	UNDERSTAND THE PROCESS SAFETY RISKS IN THE ORGANISATION		
STEP 2	Safety studues, hazard identification & risk assessment	Undertake comprehensive safety and risk assessment of all operations	Analysis and training at site and organisation levels
	ESTABLISH FRAMEWORK FOR INTEGRATED PROCESS SAFETY MANAGEMENT		
STEP 3	Develop formal operating procedures	Documented procedures, regular training, improve human performance	Policies available on company intranet
	Provide a controls for non-routine work	Permits to work systems, analysis of hazards	Policies available on company intranet
	Ensure Asset integrity and reliability	Ensure assets are fit for purpose, inspection and maintenance, analyse data	Policies available on company intranet
	Contractor management	Review contractor competence, site induction, compliance with safety rules	Policies available on company intranet
	Management of Change	Review safety impact of changes, implement and follow up recommendations	Publish results for all employees
	Operational reviews	Conduct regular reviews of operations, systems, equipment	Report to management at appropriate levels
	Emergency management	Prepare for emergencies, regular training exercises	Involve employees at all oeprational sites
	MONITOR REPORT AND REVIEW		
STEP 4	Investigate incidents and near misses	Formal reviews of near misses, incidents and accidents and learning from these	Reports to management and board
	Report key metrics	Develop key leading and lagging indicators of safety performance	Reports to management and board
	Conduct regular audits	Conduct regular audits to assess compliance with safety procedures	Reports to management and board
	Review activities and performance	Report results of audits, metrics and other reviews to management	Reports to management and board
	BOTTOM LINE IMPACT		
STEP 5	Safety performance	Formal report to Board and management	Annual report
	Asset availability and utilisation	Formal report to Board and management	Annual report
	Employee turnover & satisfaction	Formal report to Board and management	Annual report
	Profitability	Formal report to Board and management	Annual report
	Company profile and reputation	Formal report to Board and management	Annual report

TABLE A2: LEADING AND LAGGING METRICS FOR PROCESS SAFETY MANAGEMENT

	Metrics for Safety	Leading Metrics for Safety	Lagging Metrics for Safety
1	Plant design	Percentage of safety critical items of plant or equipment which comply with current codes and standards	No. of incidents that result in physical damage to containment envelope and/or loss of containment of hazardous materials due to equipment failure e.g. hoses, couplings, pumps, valves, flanges, pipes, tanks or instruments where deficiency in design or equipment below standard is a factor.
2	Operational procedures	No. of operational procedures that have not been revised within the specified time interval. Percentage of Process & Instrumentation diagrams that are up-to-date.	No. of times operations do not proceed according to procedure e.g. Product transfer according to procedure
3	Process safety training and competency	Percent of employees completing relevant training and competency assessment.	No. of staff engaging in a particular operation without appropriate training
4	Permit to work systems	Percentage level of compliance with permit to work procedures, assessed from regular audit of completed permits	No. of near misses of incidents where work was done without a fully compliant permit to work and could have damaged plant, equipment or injured people.
5	Completion of maintenance work orders	Percentage of completion of high priority items per month; No. of high priority work orders in backlog	No. of incidents that result in physical damage to containment envelope and/or loss of containment of hazardous materials due to equipment failure e.g. hoses, couplings, pumps, valves, flanges, pipes, tanks or instruments where deficiency in design or equipment below standard is a factor.
6	Testing of safety critical devices	Percentage of completion of testing of safety critical devices such as emergency shutdown and isolation systems	No. of safety critical alarms or instruments that fail to operate as designed while in use or when tested; Length of time plant is in production with safety critical equipment in a failed state
7	Completion rates of planned inspections e.g.. major rotating equipment, process vessels, tanks, structures etc.	Percentage of completion of items by priority level per month	No. of incidents that result in loss of containment of hazardous materials due to equipment failure e.g. hoses, couplings, pumps, valves, flanges, pipes, tanks or instruments
8	Management of Change	No of Changes that have complied with plant Management of Change procedures, including appropriate assessment and authorisation before commencing implementation.	No. of temporary changes on site without appropriate review, No. of incidents where the plant is found to be below desired standard due to deficiencies in the management of change process.
9	Emergency response	Percentage of staff and contractors who have been trained to take correct action in event of an emergency	No. of elements in an emergency procedure that failed to function to the desired performance during an incident or an emergency exercise.
10	Communication	Percentage of times where appropriate authorisations was provided between two different locations before work can proceed, e.g. Product transfer via pipeline	No. of times work does not proceed according to procedure due to breakdown in communication systems.
11	Safety Awareness	Report of hazards in the workplace - creates awareness of safety matters at all staff levels	-
12	Near Misses	-	Reporting of numbers of near misses that are due to errors of omission or commission, unexpected or unplanned plant condition, physical damage to containment envelope but have not resulted in loss of containment or injury.
13	Incidents	-	No. of incidents involving loss of containment of hazardous material, damage to property plant or equipment, injury or fatality

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ABOUT THE AUTHOR

Dr. Marlene Kanga AM is one of Australia's leading women engineers and was the National President of Engineers Australia in 2013, only the second woman to hold this position in its 95 year history. She is a Chartered chemical engineer and an expert in process safety and risk engineering for the chemical process industries. She has built a life-long career in chemical engineering, balancing work with family life and raising two sons. Marlene was listed among the Top 100 most influential engineers in 2013 and 2014, the Top 100 Women of Influence in 2013 and awarded the FEIAP Engineer of the Year Award in 2014, which recognised her contributions to engineering in the Asia-Pacific region.

Marlene is Acting Chair of the Innovation Australia board which and Chair of the R&D Incentives Committee which administers the largest innovation support program for industry in Australia via the R&D Incentive. She is also a board member of Sydney Water Corporation, the largest water utility in Australia.

Marlene is an experienced business leader and is Director of iOmniscient Pty Ltd which has developed world leading patented software technology for automated intelligent video analytic systems.

Marlene has held numerous leadership positions in Engineers Australia and is Chair of WEC 2019, the World Engineers Convention which will be held in November 2019 as part of the organisation's centenary celebrations and will bring the world's engineers to Melbourne.

Marlene was Chair of the National Committee for Women in Engineering in 2008 and 2009 and implemented many world leading changes to make the profession more inclusive. These innovations are being adopted by engineering institutions around the world. Marlene is an advocate for an inclusive profession and is currently a board member of the International Network for Women Engineers and Scientists (INWES). She launched the Asia Pacific Nation Network for women engineers and scientists in Adelaide in 2011 which has mentored and supported networks for women engineers and scientists in several countries in Asia.

Marlene is a member of the Executive Council of the World Federation of Engineering Organisations (WFEO) which represents 20 million engineers in almost 100 countries and is a special advisor to the WFEO President, representing the Asia-Pacific region.