ADDRESSING WORK EXECUTION IS KEY TO IMPROVING DAY TO DAY OPERATIONAL RISK MANAGEMENT AND ENHANCING PROCESS SAFETY MANAGEMENT

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Understanding and managing operational risk and improving line of sight on operations are ongoing challenges for hazardous industries. As stakeholder expectations of operational performance continues to rise exponentially, it has become much more of a critical issue for leadership and the boardroom. Traditionally, organisations address these challenges with better rulebooks, new "leading" or "lagging" indicators, improved best practices and more robust procedures. However, more often than not there is no noticeable decrease in the number of High Potentials (HiPO's,) incidents and fatalities. The continued focus on "find and fix" rather than "predict and prevent" is at the heart of the challenge.

The interaction between People and the Plant, also known as frontline work execution, is a key Process Safety blind spot. It is the riskiest part of operations as it is where frontline workers do routine work to maintain and operate the plant, maintain the equipment and manage interventions; yet as an industry we typically still manage this critical business process with paper. The majority of paper systems function as nothing more than a 'checklist'. The lack of embedded process rigour virtually ensures the inconsistent application of work execution processes, governing controls, permits, isolations and approvals.

Next generation technology can provide operational performance & predictive risk capabilities, ensuring the interactions are fully captured and embedded into operational processes. Connecting policy to practice this way ensures frontline workers are carrying out their work according to corporate standards while capturing and generating valuable data on the type, volume and interaction of work, as well as associated human factors. By capturing this data, common risk metrics can be viewed across the operations. The data can be aggregated into risk indices for the Enterprise, Assets and Plants. Operational leaders can then use these leading indices to manage and monitor the organization to a less risky, more efficient performance and improve Process Safety Management (PSM).

By addressing this key area with technology and the use of valuable frontline data generated as a part of routine work processes, senior management can have peace of mind they are delivering performance while reducing uncertainty around a key area of operational risk.

1. INTRODUCTION

Managing operational risk is a complex area in which hazardous industries face a number of common challenges. Frontline work execution is the riskiest part of operations and is a key blind spot. It is where frontline workers do routine work to maintain and operate the plant, maintain the equipment and manage interventions, yet as an industry we provide our frontline work teams with nothing more than paper forms in triplicate as the means of control. While the content of these forms may be very sophisticated, they function as nothing more than a checklist for critical business processes such as Permit to Work (PTW), Job Safety Analysis (JSA) and Lock-Out Tag-Out (LOTO). The lack of embedded process rigour in these systems virtually ensures the inconsistent application of work execution processes, governing controls, permits, isolations and approvals.

Risk analysis conducted for the design of the plant as well as for operations, seldom takes into account the ad-hoc and non-routine nature of frontline work during the execution phase. With only paper forms and processes, frontline workers have limited tools to manage risk, optimise work or help them make the right decisions. More importantly, this lack of automation also means that management has no data from these activities with limited or no visibility, oversight or control over how efficiently or safely the work was performed. Without data the indicators that are available, are typically lagging and "rear view" metrics based on an auditing process that is too infrequent, reactive and compliance driven. Indicators or metrics are only useful if they result in effective intervention. Given the absence of data from frontline work activity it is understandable the industry struggles to establish line of sight on its actual frontline operational risk.

It should therefore be no surprise that the interaction between people and the plant is where injuries and fatalities are most prevalent and where escalation can pose the greatest risk to process safety. Workers are effectively isolated and forced to rely on their individual skills and competencies. Lessons learned are lost, feedback loops are missing and best practices are not spread throughout the business. Frontline operations have changed very little in the past 40 years and as an industry we place significant pressure on the shoulders of those who issue and approve work, based on limited paper systems to get day to day operational risk right. For all practical purposes the single greatest area

of operational risk, the interaction between people and the plant is tackled by individual competency.

To address these issues, a fundamental change in the way frontline operations are managed is needed. New processes are required that operationalize the safe work execution rules and establish structured procedures to ensure that people are guided to the correct operational decisions, appropriate to their conditions and context. Technology solutions can enable organisations to intelligently embed, automate and manage frontline work processes, while providing the means to measure and extract meaningful insight.

2. THE BIGGEST OPERATIONAL RISK

Carrying out work at the frontline in hazardous industries involves three primary elements; the Plant, the People and the interaction between the people and the plant. The interaction between the people and the plant represents millions of man hours per year for the typical organisation and thousands of people every day who routinely intervene in plant operations to do repair and maintenance work. This work often results in the introduction of new hazards, inhibiting safety systems, isolating parts of the plant and interfering with standard operating procedures. The interaction between people and the plant, also known as Work Execution (WE), equals operating risk.

It includes every aspect of planning, controlling and executing all work tasks being carried out on hazardous plants. Some companies refer to WE using different terms such as Control of Work, Work Management or Work Control. The majority of this work will be maintenance, repair or construction but it can also include routine tasks necessary to support the operation. The term encompasses all aspects of work management including permit control, Isolations and reinstatements or Lock-Out Tag-Out (LOTO), Task Risk Assessment or Job Safety Analysis, Temporary Defeats/ Inhibits/ Override etc. In general it includes all work which needs to be controlled due to its hazardous nature, the lack of familiarity of the people involved, or the need to coordinate multiple ongoing tasks and operations.

Work Execution is the single biggest area of HiPO's and is the primary source of fatalities (after road traffic accidents) according to a study carried out by a major oil company. In this study three factors relating to "Work Control" were identified: Planning of Work; Work Rules, Policies, Standards and Procedures; Management, Supervision and Leadership. Reviewing fatal industrial accidents over a 5 year period it was found that ninety percent (90%) had one of these elements as a contributory factor. Seventy one percent (71%) had two of them and thirty percent (30%) had all three.[1] Similar statistics from other companies about fatalities and major incidents indicate the same contributory factors, so clearly getting WE right is critical to the safety of our plant workers.

If we look at some of the well-publicized major accidents such as Piper Alpha, Texas City, Buncefield and Phillips Pasadena, we see that they all involve varying degrees of failing in WE. Michael Ferrow (2011), the General Manager of Engineering and Technical Assurance at ConocoPhilips (UK), in his SPE paper entitled, *An Operating Management System to Deliver Safe Operations* furthers this by stating that "the other conclusion in looking at all of these accidents (Oppau, Germany; Feyzin, France; Flixborough, UK; Piper Alpha, UKCS; Texas City, USA; Buncefield, and UK; Deepwater Horizon, USA) was that in almost every case there were three clear contributors:

- Absence of adequate risk assessment and understanding
- Management of change
- Inadequate control of work at the workface" [2]

When we examine typical WE operations, we see that often these barriers are deliberately removed, safety devices inhibited and new hazards are introduced to the workplace in the course of carrying out work. For example: to access, replace or repair equipment it is often necessary to break containment of hydrocarbon bearing systems; safety related devices such as alarms and shutdown systems frequently need to be inhibited or taken out of service to perform work without shutting down the plant; accessing equipment often involves working at height or having to perform heavy lifts over live plant. Such scenarios are daily occurrences on most plants.

More often than not, this work is taking place inside a live plant where production has to be maintained while the intervention work is carried out. The work, by necessity, brings people into the plant area putting them at risk. The majority of frontline workers will be 3rd party contractors less familiar with the hazardous plant on which they are working and perhaps less equipped to understand and address the process hazards surrounding them. A further complication is that typically multiple jobs of work need to be managed simultaneously on the same plant with the potential for work clashes and compounded risks.

The types of hazards being managed in WE are a combination of Process Hazards, e.g. flammable/ explosive hydrocarbons under pressure; equipment hazards such as rotating equipment and occupational hazards such as working at height; dropped objects and environment hazards such as confined spaces, temperature, noise, etc. These examples are not comprehensive and the list of hazards is endless, as is the manner in which they can combine and escalate to a major incident. It is important to note the wide range of hazards and that this is not merely about "slips, trips and falls" or those hazards with the potential to cause minimum harm to individuals. Managing the risk posed by process hazards is paramount, particularly for those working in close proximity to and with less familiarity of such hazards.

Another important aspect of hazards introduced through WE is that they are dynamic and constantly changing from day to day, hour to hour depending on ongoing activities. The process hazards, on the other hand, are relatively constant for a well-designed and well maintained plant operating steadily. Even with process upsets, the design of the plant and its control should be able to

manage these without risk of loss of containment. Plant control systems are designed to operate within design limits and shutdown systems automatically take over if operators exceed these designs.

With each day typically presenting different hazards and risks and with inadequate tools to support the decision making process it is not surprising that WE related incidents occur. While the industry's traditional response has been to deem this a workforce culture or people problem, there appears to be a deeper underlying issue.

3. THE ROOT OF THE PROBLEM

The root of the problem lies with a critical gap in the operational assurance process loop for the Interaction between People and the Plant (Fig. 1), arguably the riskiest part of our operations. If we look at the other elements, organisations have operational assurance loops for the Plant and for their People that include policies, standards, practices, systems, data, KPI's/metrics and feedback. In this way they have operational assurance that their policies are being followed and they have the means through the use of the right technology and the collection of data to measure status and progress.

For example, on the Plant side there is a full feedback loop and a set of well-defined principles enshrined in Process Safety Management which are used to design, build and operate the plant. Distributed Control Systems (DCS) are an integrated part of the plant and are essential for the safe and efficient operation. They are connected to sensors that can monitor and control variables such as pressure, temperature, level and flow through the plant. When a measured variable reaches a certain point the system can act automatically to ensure a specific process reaches its desired setpoint or even automatically shutdown systems.

With our People, we have invested substantially in terms of competency training, human factors and occupational safety. We have detailed policies, standards, training programs, data, KPI's on our programs and metrics including days away from work, as well as sufficient feedback to improve policies in a cycle of continuous improvement. This is not to dismiss nor downplay the importance of addressing the workforce culture issue or the focus on human factors but to solely to put them into context.

When we look closer at the Interaction between People and the Plant, although it also has policies, standards, practices and often paper based systems; there is no data, no metrics and as a result, no feedback loop of any consequence. As the industry traditionally relies on paper based system as its form of control in this area, there is no data. Paper based forms provide neither real data nor a window into on-going work, thus leaving senior management with little to no oversight over the riskiest part of their operations. Without systems we do not have data and without data we cannot measure performance thus severely limiting management's effectiveness in driving improvements in operational performance.

The importance of this critical gap in the riskiest part of our operations cannot be understated. The volume of the Interaction of People with the Plant, due to its sheer size, places considerable stress on the operational assurance loop. Factors such as the employee-contractor mix, the assumption of contractor competence on the part of the

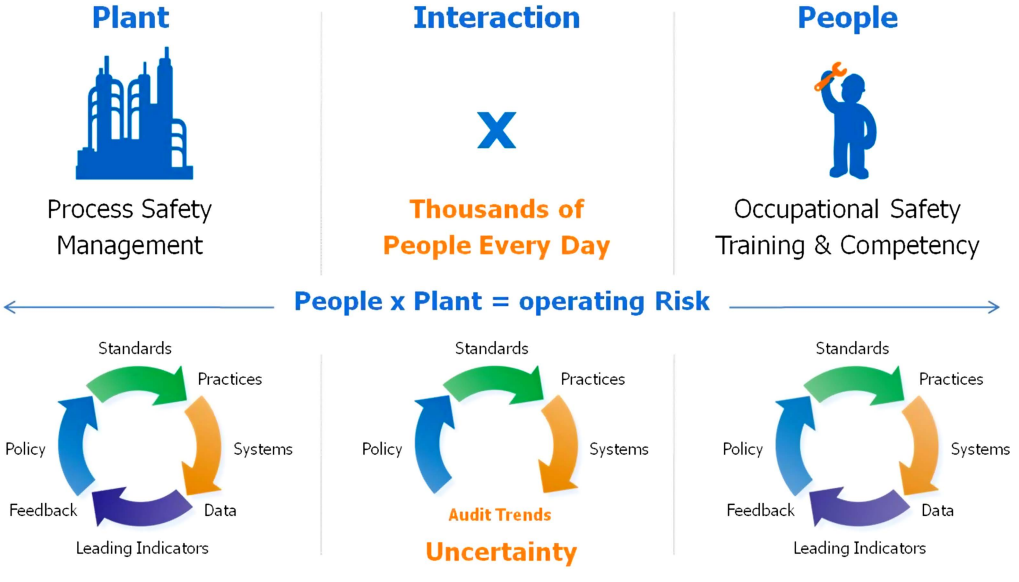

Figure 1. The Root of the Problem

operator, the workforce culture and the natural tension between performance and safety all serve to exacerbate the gap. The impact of this critical gap often manifests itself in terms of unplanned shutdowns, loss of production, improvement notices, reputational risk, higher insurance premiums and unfortunately incidents and accidents. This operational assurance gap needs to be closed but how can it be done a way that can create a culture of continuous operational improvement?

4. THE ROLE OF TECHNOLOGY

Technology has been a significant enabler of business process improvement in other industries and can provide the basis to address the critical gap in the operational assurance loop of the Interaction between People and the Plant. It can provide the ideal platform for continuous improvement of operational performance. Corporate, regional and local policies and processes can be intelligently embedded, automated and managed across the organisation, ensuring the organisation's strategic intent is linked to the execution of its critical business processes and improvement initiatives. In this way, risk controls and guidance can take shape outside of the 'rule book' and become an integral part of routine operations. The work execution process can be captured thus providing a window into how well frontline operational risks are being managed.

Operational Performance & Predictive Risk systems that manage WE, integrate frontline "paper" requirements, linking permit to work with the risk assessment and isolation management processes to create a fully integrated Control of Work System become a system of record for frontline work execution data. The systems incorporate clear process flows for request and approval of work, a direct link to relevant Operating Procedures, readily-accessible archives of previous work (including lessons learned) and area, site and plant-level overview of all controlled work by approval stage, location, time, type and risk level. This ensures people are guided to the correct operational decisions appropriate to the actual conditions and context of the work at hand.

With next generation technology, practical processes combined with consistent leadership and evolving competency can sustain a change in the way people operate, ultimately changing behaviours. Best practices can be consistently applied whether these are rules, regulations, processes or lessons learned, not only providing safety and assurance benefits but also delivering efficiency gains, better ways of working, an improving corporate knowledge base, shorter execution time and reduced administration. Frontline workers interact with the systems via a simple web-browser using familiar forms and language. Rules, procedures and standards can be operationalized within the system to provide enhanced and structured decision making around risk assessment requirements, permit usage, isolations and Temporary Defeats. Frontline management can make better operational decisions to deliver safe and efficient operations through the use of technology. It can complement existing safety systems and deliver enhanced safety management, allowing operators to proactively identify, evaluate and mitigate risks.

5. POLICY INTO PRACTICE

Operational Performance & Predictive Risk systems provide organisations the ability to intelligently embed corporate, regional and local policies and processes ensuring they are consistently delivered in frontline practice across the organisation. The risk controls, work processes, best practices and guidance can take shape outside of the 'rule book' and become an integral part of routine operations. In this way there is operational assurance the organisation's strategic intent is linked to the execution of its critical business processes and improvement initiatives.

Organisations have the ability to deploy a common baseline across their organisation but also account for regional and local requirements and variations (Fig. 2). While local flexibility may be required, the organisation can still ensure that, for example, all breaking containment work is performed in the same manner with the same baseline controls across the entire organisation.

Senior management now have the tools to not only address the way operations are set up across the enterprise, but to ensure and vastly improve upon how the work is executed on a day-to-day basis. Having the right information at hand helps organisations to optimise operational efficiencies while improving operational performance. Policies and processes can be optimised and improved based on real data and meaningful insight, ensuring the organisation's strategic intent is linked to the execution of its critical business processes and improvement initiatives.

6. THE DATA

Technology deployed to close this critical gap and improve operational performance and predictive risk capabilities, supports frontline WE and as a result provides access to data that is generated as part of routine work. As we have embedded and automated our frontline work processes in a consistent manner across our organisations we have the ability to build common metrics. The rich data inherent in building and completing permits, risk assessments, interventions and other elements can be captured in planning, execution and completion modes. This data can provide insights into how work is actually carried out and the degree to which the frontline is executing work processes in line with the organisation's policies, procedures and improvement initiatives.

In use, enterprise operational performance and predictive risk technology systems delivers high value information to the plant authorities. Approval lifecycles for each piece of work provide a clear audit trail. The current, past and future status of all work on the plant is clearly visible; on a timeline and by location. Potential work conflicts are highly visible to the plant authorities and are managed in advance rather than at the time. Pre-work requirements ranging from hazard controls (e.g. barriers),

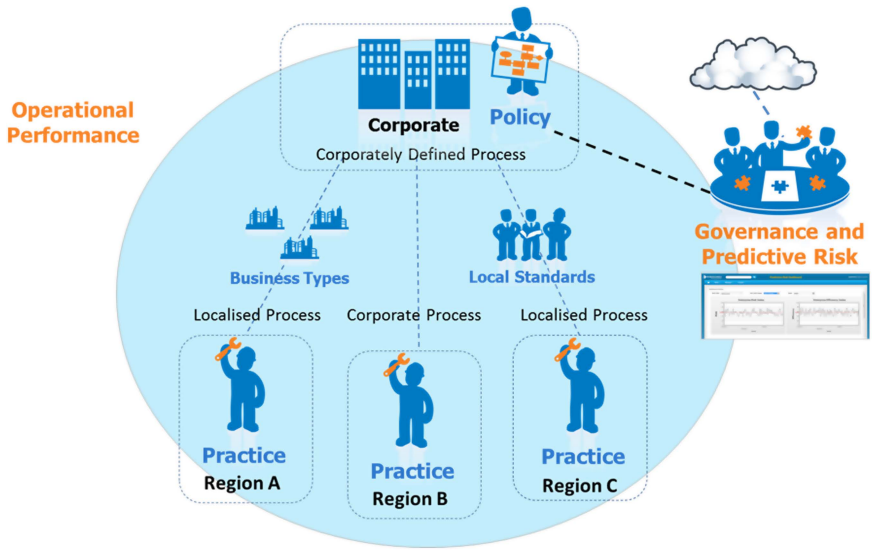

Figure 2. Policy into Practice

access needs (e.g. scaffolding, confined space entry) and plant isolations (e.g. electrical, mechanical) can be planned and implemented more efficiently. Frontline workers have access to lessons learned; sharing previous experience at their own worksite with other plants and worksites across the organisation.

Over time, the data collected as a part of these routine work activities can be used to provide visibility and accountability, as recommended by the International Association of Oil & Gas Producers. In their report entitled *Process Safety-Recommended Practice on Key Performance Indicators*, it states that "as such incidents [resulting from multiple, simultaneous barrier failures] do not occur very frequently, it can take a very long time to gather statistically relevant data on major incidents alone. Therefore, systems need to be implemented for consistent collection and analysis of data and related information on more than just major incidents." [3]

For the first time, management is able to access not just relevant historical data, but also new leading indicators

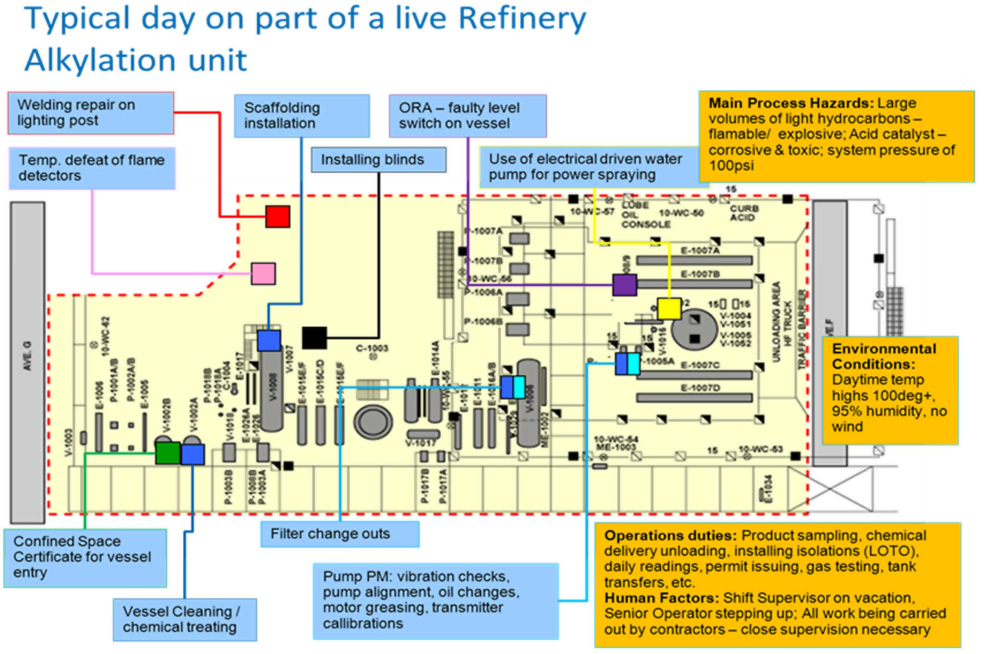

Figure 3. Live Refinery Alkylation Plant

of both operational risk and work efficiency. Real time risk profiles based on cumulative risk can be generated and viewed as they change throughout the shift, providing visibility across the plant and also outside the plant providing our frontline supervisors the ability to effectively predict and manage risk.

7. CUMULATIVE RISK

By better understanding what defines frontline cumulative risk and capturing the appropriate data, we have the key to developing valuable leading indicators that can determine risk trends and encourage better decision making. In frontline WE, managing cumulative risk applies not only to the sum of the parts of one job, including the hazards, controls, external factors, but to all of the daily tasks and procedures being carried out on an installation and their interaction and impact upon each other. It is not unusual for 20 or more independent jobs to be in progress simultaneously within a defined area. While these individual tasks may have been independently risk assessed and authorized, there are dependencies and interactions between the jobs that need to be taken into consideration in order to reduce the potential overall risk of the combined jobs. Typical PTW and even electronic PTW systems fall short in this area as they do not collect data in a consistent and efficient manner, nor do they allow users to manage work holistically across the plant, as they are focused on independently managing the lifecycle of each controlled job.

Let's consider a typical section of a plant, for example, the Alkylation unit of a refinery. For simplification, we will assume that the major process hazards which must be considered are a) the large inventory of explosive and flammable hydrocarbons and b) a volatile acid catalyst which is corrosive and toxic. On any given day the plant is live with a high throughput and these fluids are being contained in the pipes and vessels which have been designed for such service. Contingent systems are in place to detect loss of containment and to take action to mitigate any consequences such as; system shutdown and de-inventory; fire detection and water deluge; acid detection and water spray systems to knock down any release cloud. Emergency response plans will deal with evacuation, shelter and containment action to be taken by the Operations Team.

With steady conditions and a well maintained plant, the process hazards are relatively predictable. The containment and contingent measures significantly reduce the risk to a predictable, constant and acceptable level but do not eliminate them altogether. They are, however, not the only hazards to be considered. The additional hazards tend to be less constant as they vary from day to day, reflecting the reality of plant operations. Before we look at WE activities, there are some Human Factors aspects which could be considered "hazardous" created by the Plant Operator team on shift at any time. In the example shown below (Fig. 2), there are typical Operations duties: sampling, chemical loading, preparing equipment for maintenance (LOTO), daily readings, permit issuing, gas testing, transfers, etc. Another typical example could be that the Shift Supervisor is on vacation and a Senior Operator is stepping up. Similarly, the Senior Operators role is being filled by a step up from the ranks. Whilst not being abnormal, it does create a reduction in the overall experience and competence of the shift and an obvious increase in operational risk.

Human Factors and environmental conditions could also include contractors less familiar with the plant and its process hazards as well as prevailing working conditions – primarily climate related but also worker fatigue, travel times prior to arrival at the plant or distractions such as industrial action, wage/contract negotiations or personal crises at home. While these human and environmental factors can be difficult to measure they do have an impact and are often cited as contributing factors during incident investigations and should be recognized as impacting operational risk.

Work activities which vary from day to day, add a level of operational risk that is higher than for simply operating the plant. The residual risks posed by the process hazards are still present but there are now additional hazards to personnel for the Operations Team to manage. Each job is managed independently to minimize the residual risk posed by each hazard. The cumulative effect of each hazard's residual risk is seldom assessed formally but is tacitly acknowledged as being acceptable when a permit is issued for the work to commence. The cumulative effect of multiple jobs coupled with the process hazards and any human factor or environmental hazards are seldom assessed in a formal manner on a day to day basis. Work schedules are assessed for clashes where two or more jobs may interfere with each another but we do not equip our plant supervisors with the right tools and techniques to properly assess these types of risks. In other words, decisions are being made without full information; decisions which sometimes can lead to catastrophic failure.

8. OPTIMISE WORK IN TIME, SPACE & RISK

With the visibility, an Operational Performance and Predictive Risk system can provide, frontline supervisors have the ability to optimise work in time, space and risk. Our frontline supervisors can use the tools to improve how we manage the interaction of our people with our plants. This provides the ability to optimise operational performance, reduce risk, drive improvement and move beyond compliance.

Figure 4 represents the dynamic visualization of the safe work plan. Traditionally, we have provided the people responsible for planning frontline work with very few resources or tools to determine the right balance between the type of work, the volume of work and the cumulative risk of the work. While most organisations have clear standards for SimOps in terms of what work can be done at the same time as other types, we as an industry have essentially left it to our frontline supervisors to "juggle" risk rather than provide them with the tools to properly "manage" risk. The

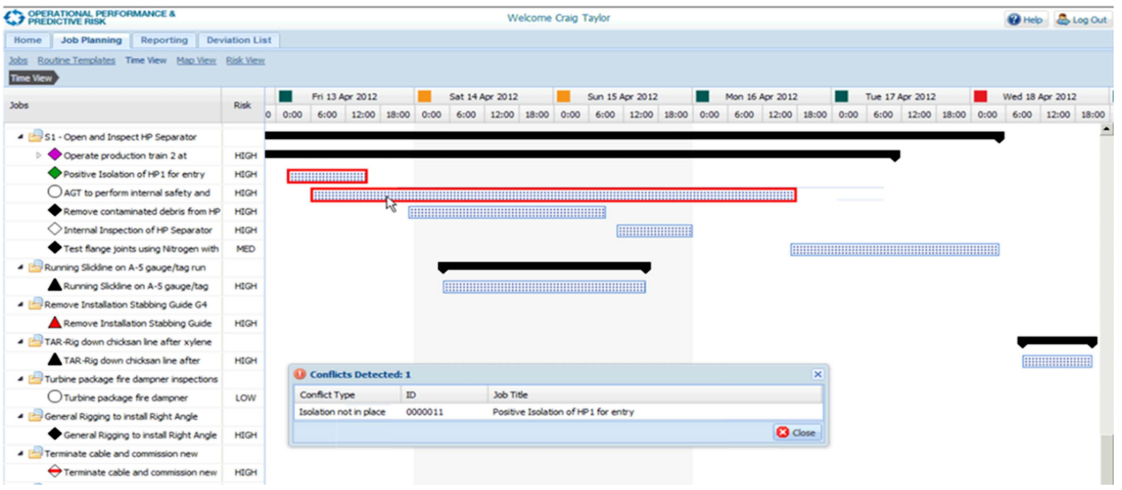

Figure 4. Optimise Work in Time

visualization of the "actual" plan reflecting the frontline realities provides our people who issue, review and approve work further assistance to both structure and improve their decision making. It provides visible conflict detection capabilities to ensure that certain combinations of work are flagged to supervisors as well as hard rules to prevent specific combinations of work from occurring at the same time (e.g. Hot Work and Breaking Containment).

The ability to visualize work in space (Fig. 5) provides another dimension on how to improve SimOps and optimise work. We can see where work is occurring or planned during a defined period across our plant providing us with a holistic view. We can also see the process hazards in the area as well as any deviation from standards – operational risk (safety system inhibition or running equipment at levels outside normal conditions).

The rich data inherent in building and completing work, risk assessments and interventions allow frontline supervisors to optimise work by predicting and proactively managing risk profiles. These leading indicators enable the adjustment of planned activities to minimise operational risk, while also optimising efficiency and providing visibility over real-time risk profiles across the plant. We can see the risk profile for the "Plant", the "distribution" of that risk across high medium and low risk jobs as well as see down to the "Area" level the "risk profile" (colour) of the risk level and the number and highest job risk profile for that area.

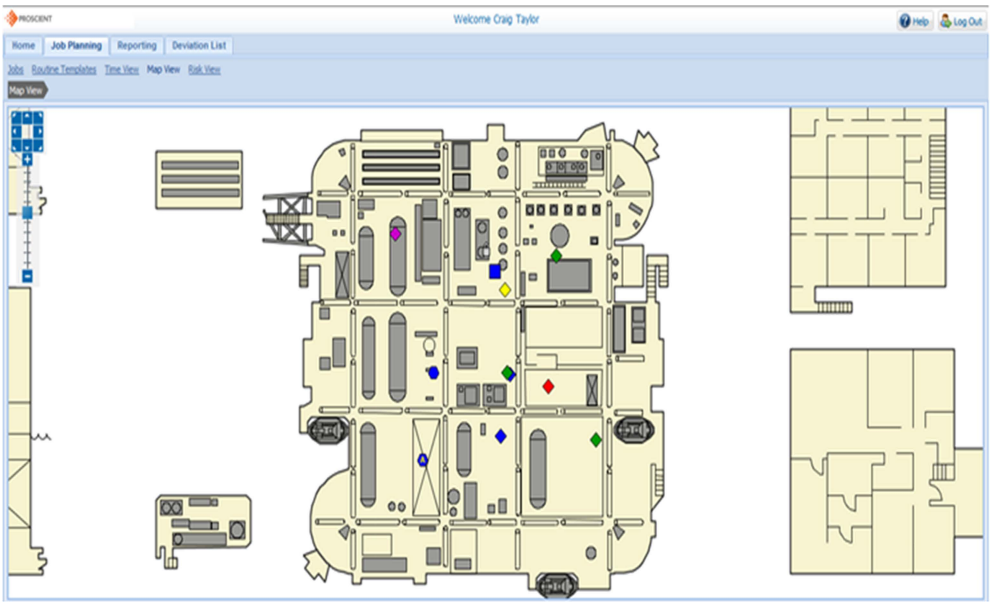

Figure 5. Optimise Work in Space

These visualization, optimisation and risk management tools provide organisations the ability to:

- Understand the true nature of cumulative risk and avoid combining certain tasks
- Find alternative ways of performing high risk activities to reduce risk and enshrine these in best practice by incorporating them in the Enterprise major hazardous task templates and associated control mechanisms
- Avoid high levels of risk during critical times like shift change over

9. PERFORMANCE INDICATORS

With the practical and meaningful data generated as a part of routine work processes it can be made available to decision makers across the organisation. For the first time they can start to understand the relationship between performance and risk and proactively manage the organisation to less risky and more optimised performance. With enterprise capabilities, senior management can build performance indicators to use as key input to exercising oversight and use the data to not only demonstrate and move beyond compliance but build the foundation for continuous operational performance improvement.

To date, most leading indicators tend to alert Management that there are problems. The corrective action, usually following a more in depth review, will typically be either policy/business process change and/or competency improvement. However, the key issue with lagging indicators is that, whilst they are important to measure performance, they tend to be reactive, focusing on a "find and fix" culture, as opposed to being proactive. There is a danger of misinterpreting the data being collected and of drawing incorrect conclusions.

With WE, we have a problem because there has traditionally been such a scarcity of data in this space that no effective PI's have emerged. However, with next generation technology systems in place we can generate and collect data as a part of routine operations. Data from the individual job details, risk assessments, permit types, scheduling and other areas is available to be used as part of the automatic cumulative risk calculations in order to generate and understand cumulative risk profiles. Process hazard data is input once only as part of the plant design. Other variables such as human factors and environmental data can be input daily. Some of the data which could be used to build relevant indicators of daily WE risk could include:

- Type of Jobs
- Volume of jobs
- Complexity of jobs
- Interaction of the Jobs
- Simultaneous operations (SIMOPS)
- Environmental factors
- Human factors

Work Execution performance can also be judged in terms of the efficiency with which work is executed, the attainment of planned work and the effective utilization of resources are all measures that are important to how we judge the effectiveness of our WE practices. The degree to which some plants will tolerate high levels of risk may be different but at a minimum, the transparency provided by these PIs can help to drive improved decision making. If these systems are deployed at an enterprise level, comparisons between plants will be relatively straightforward, providing the ability to compare and contrast plant performance in terms of plan attainment and operational risk. From a governance perspective, these systems provide an insight into frontline operations never seen before, providing a range of possibilities which have yet to be considered.

Given that data is being collected for both planned and completed work, risk profiles can be created for areas of the plant, the plant as a whole, the asset and for the entire organisation. Frontline supervisors can view the current risk profile for the plant or for each area of the plant (Figure 7), understand the contribution of risk from high, medium and low risk jobs .They can also see in which areas of the plant have the most risk for the day based on planned and live work and these tools can be utilized to better optimise work while reducing operational risk.

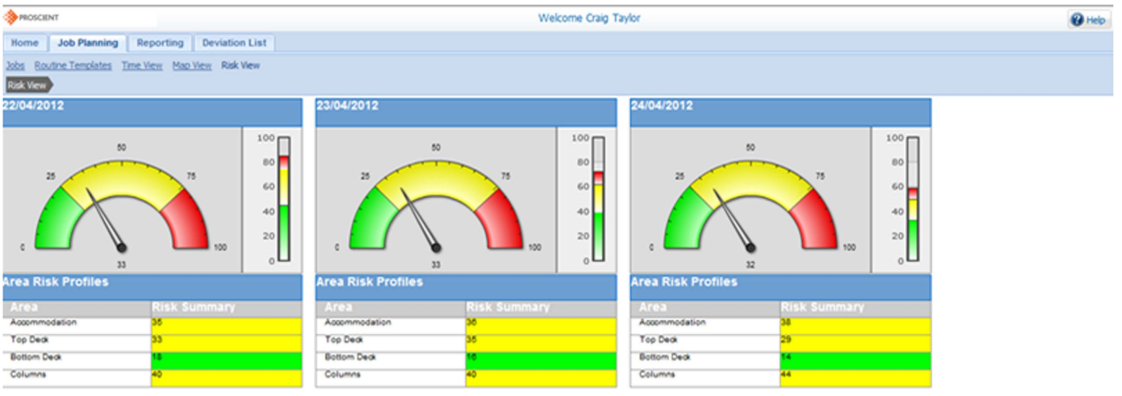

Figure 6. Optimise Work in Risk

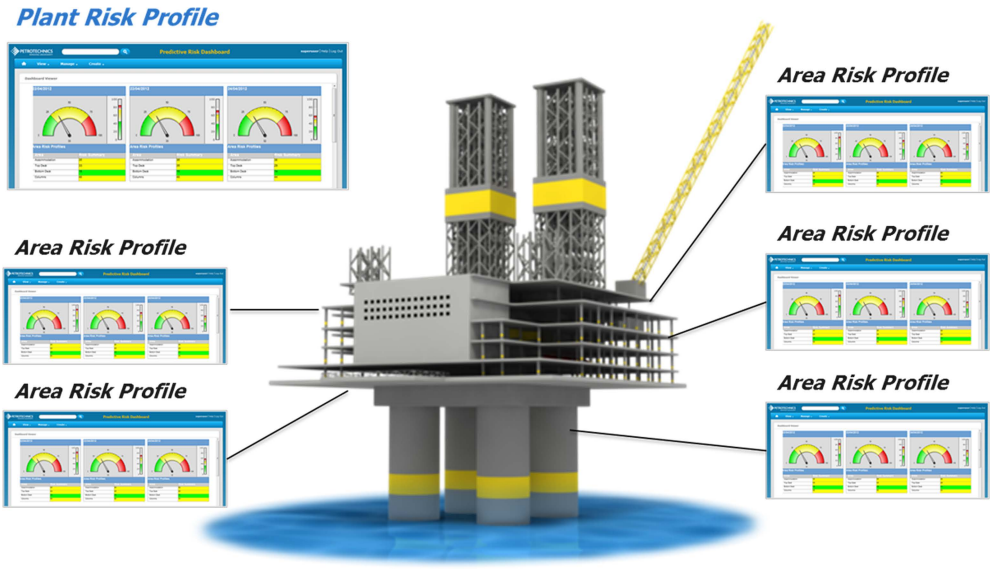

Figure 7. Plant and Area Risk Profiles

Such systems will allow Operations Teams to identify cumulative risk issues during the near time planning of jobs. These tools provide a view of work in space, have very simple planning visualization modules where work planned for the coming few days can be seen not only in terms of its clashes and demands on local resources, but also through a cumulative risk picture. It will highlight periods of excessive risk and allow the Operations Team to simply move planned work packages in time in order to reduce the predicted risk to more acceptable levels.

Data can then be aggregated from across the organisation to build enterprise level leading indicators. Senior Management can start to understand the relationship between delivering performance and operational risk. They can also move beyond the anecdotal and rear view window audit metrics, to see now or over a period of a few weeks, if one of their plants is consistently carrying too much cumulative risk, how that level of cumulative risk compares to the current organisational trends and whether that level of risk is outside the norm for that plant. The "Executive Dashboard" (Fig. 8) provides a meaningful view of the data when an operational performance and predictive risk system is implemented consistently across an organisation.

- The Enterprise Risk Index (top right side of Fig. 8) plots the daily risk scores for the organisation and then trends the risk profile (red line) over the time period to provide management with an indicative view of the three month risk trend of the organisation.
- Asset or Plant Risk Index (bottom right of fig. 8) provides local, regional and senior management can have an indicative understanding where each plant or asset sits and the direction it is heading.
- Asset Risk Trending Index shows (top left of fig. 8) the average risk level per asset over a time period versus its trending direction. The y-axis represents the level of risk and the x-axis the slope of for each Asset Risk Index trendline. So for example in this chart, any of the bubbles to the right of the y-axis have risk indexes that are trending upward to a more risky position and those to the left of the y-axis are improving. By seeing individual assets against their average risk score and trending direction, operational leaders understand where they need to act, mitigate, drive and monitor.

Senior management can use these enhanced indicators and improved organisational knowledge from the riskiest part of their operations, to enable their organisations to move from "find and fix" to a culture of 'predict and prevent'. Operational insight can be viewed from frontline to the boardroom, enabling all levels of employees to make more informed decisions in real-time and for future planning. With powerful and accurate information at hand, management and corporate level employees are empowered to 'intervene' at any time to change plans and priorities, preventing any foreseen incidents and potentially fatal accidents.

SUMMARY

With Operational Risk Management a board level challenge, stakeholder expectations of operational performance have never been higher. Closing the gap for the Interaction between People and the Plant should be a fundamental priority for the industry. It is the riskiest part of our operations, the leading cause of HiPo's, the second leading cause of fatalities and a major contributing factor in almost all process safety accidents. We can no longer expect our frontline workers to "get by" with 40 year old solutions based largely

Figure 8. Executive Dashboard

on forms in triplicate. It is time to bring our frontline workers into the 21st century by providing them with the tools and technology to support them in making the right structured decisions, ensure more consistent operational risk management and adherence to standards across the industry.

Operational Performance & Predictive risk systems can serve as the ideal platform to intelligently embed, automate and manage corporate, regional and local policies and processes in a consistent manner across the organisation. Real time risk profiles can be generated as a result of the data captured by routine operations. These cumulative risk profiles can be viewed as they change providing visibility across the plant and also outside the plant providing our frontline supervisors the ability to predict and manage risk. With practical and meaningful data aggregated across the organisation from routine work activity, decision makers can for the first time start to understand the relationship between performance and risk and proactively manage the organisation to less risky and more optimized performance. As an industry by closing this critical gap in the operational assurance loop it will go a long way to providing peace of mind that we can deliver increased performance in a responsible manner while reducing operational risk, driving continuous improvement and moving beyond compliance.

ABOUT PETROTECHNICS

Petrotechnics was founded with a vision to keep more people safe in hazardous industries. Over the last 12 years, Petrotechnics has pioneered, proven and successfully helped organisations in hazardous industries increase operational efficiency and improve safety in the riskiest part of their operations. As a result across the more than 350 sites in 22 countries and more than 50,000 people, our customers benefit from the direct and tangible ROI associated with increased production, a significantly safer frontline work environment and the hard benefits directly related to getting more work done safely.

Our Operational Performance & Predictive Risk solutions provide the ideal platform on which you can build a culture of continuous improvement within your operations. They enable your organisation to intelligently embed, automate and manage your corporate, regional and local policies and processes while giving you the means to measure and extract meaningful insight. This provides your organisation the confidence it has the ability to deliver on targets while removing uncertainty around this key area of operational risk. With practical and meaningful data available to decision makers across your organisation, for the first time they can start to understand the relationship between performance and risk and proactively manage the organisation to less risky and more optimized performance. You can have peace of mind that your organisation can deliver targets in a responsible manner, reduce operational risk, drive continuous improvement and move beyond compliance.

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