Improving Efficiencies of Short Duration Projects During Turnarounds: A Case Study on Innovative Breathing Air Solutions
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Abstract

A frequent challenge during facility shutdowns and turnarounds is the congestion of work areas. As a result, carrying out short-duration tasks such as blinding with powering pneumatic tools take much longer time due to equipment transport and set up the process. To respond to this challenge, a portable breathing air delivery unit was designed with a narrow footprint to allow quick and easy deployment even in constricted work areas.

The portable breathing air unit provides ten man-hours of breathing air and can support two users. It has a separate air tool port to power pneumatic tools. A backflow preventer ensures that air tool cannot contaminate the breathing air supply. As a safety measure, the air tool supply shuts down at 1000 psi, leaving the worker with approximately two man-hours of breathing air. To ensure that personnel have the required safety equipment and the ability to complete their assigned jobs, the unit is equipped with a platform to transport required gear to remote work areas.

The portable breathing air unit was recently put to the test by a Gas to Liquids company during its emergency facility turnaround. This is a case study for the use of such system capable of providing both breathing air and power tools in constricted work areas. During a turnaround for example, to remove a set of flange bolts from a pipe, the entire operation may take 10 minutes, but the actual operation of the air wrench may only take two minutes of that time. However, actual job tickets indicate that a 10-minute job takes a minimum of 30 minutes to one hour to complete due to the long process of deploying safety gears, breathing air systems and a separate pneumatic power source. By utilizing this portable breathing air delivery system with a dual purpose, activities such as blinding can be done more efficiently while ensuring personnel safety.

This case study discusses the significance of this innovation in improving efficiencies during turnarounds.

Introduction

The Occupational Safety and Health Administration (OSHA) defines isolation as the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tag out of all sources of energy; or blocking or disconnecting all mechanical linkages.

OSHA also defines blanking or blinding as the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe with no leakage beyond the plate.
Blinding or blanking is one of the most common tasks done during turnarounds. Although this is considered to be simple, short-duration tasks, any delays while conducting this task has a huge impact on the efficiency and cost of a turnaround. Common incidents associated with blinding or blanking include slips and trips and falls from height.

The International Association of Oil and Gas Producers (IOGP) reports that the industry’s overall Lost Time Injury Frequency (LTIF) has plateaued from 2007. The 2013 Safety Performance Indicators show that there were 1,627 reported injuries resulting in at least one day off work. The greatest number of incidents was reported as ‘Struck by’ (23%), ‘Caught in, under or between’ (21%), while ‘Slips and trips at the same height’ and ‘Falls from height’ account for 17.1% and 10.8% respectively.

These incidents are generally associated with unsafe human behaviors such as when carrying or moving cumbersome objects or simply carrying too many objects at one time, not paying attention to surroundings and walking distracted, taking unapproved shortcuts and being in a hurry and rushing. In the industry, turnarounds are known to make the most significant portion of a plant's yearly maintenance budget. Incidents such as these underscore the importance of a safety culture and the use of innovative safety equipment to avoid negatively impacting the company's bottom line.

Statement of Theory and Definitions

During turnarounds and shutdowns, workers open and blind pipes, line or duct to do maintenance and repair work. Following equipment shutdown procedures, companies transfer remaining liquids and gases to other process equipment in the plant either by pumping or by pressuring off with a dry, inert gas, such as nitrogen, supplied at a pressure higher than that on the equipment.

Once this is accomplished, companies may valve in the system and vent the remaining pressure to destruction or decomposition device. After the equipment is depressurized and is liquid-free, companies put the equipment under vacuum and install steel slip blinds at the isolation points to prevent any gas from leaking back through the blocked valves from other parts of the system.

Due to the dangers these tasks presents, OSHA puts the responsibility on the employers to ensure that the workplace is devoid of any serious potential hazards and workers are advised to use the appropriate life protecting equipment. It is standard practice for contractors to request separate six-cylinder breathing air systems for this purpose.

Thus, supplied breathing air is required prior to attempting to conduct a blinding or reopen blinded valves. Without breathing air, the Permit to Work and Job Safety Analysis will not be approved, and contractors cannot begin work on blinding and isolating pipes, line, or duct. A safety officer in the line of sight also has to be present to help ensure safety for workers during isolation and blinding tasks.

However regular or common it may be, blinding is a critical activity during turnarounds that need to be carried out accurately and safely. Process equipment that need to be cleaned, inspected, repaired or tested during turnarounds is typically isolated from other refinery equipment by the use of blinds. Any maintenance or repair work in plant components such as reactors, towers and drums, furnaces and boilers, exchangers, out-of-service lines, pumps, compressors, and tanks, can only be done when workers have sealed and drained off pipes by installing blinds.

When delays and incidents happen due to blinding, there is a domino effect for the whole turnaround. The consequences of such delays can have a huge impact on turnaround cost since every associated or connected part is affected and productivity goes down while plant management and contractors try to solve the issue. Any disruption to planned work affect cost and makes the project volatile and challenging.

Description of Method, Process, and Application

Before installing blinds, workers need to verify that the system is under vacuum by reading an appropriately ranged pressure gauge or by cracking open a bleed valve. Normally, blinds are installed in lines that have been emptied, purged and/or washed. Still, when removing full face blinds or plugs located on bleed valves where vacuum connection is made, workers are advised to exercise caution since toxic gas can be trapped behind them.

Ensuring that personnel have the required safety equipment available to complete efficiently their assigned jobs is a critical factor. Add to this, short-duration tasks such as blinding demand time, resource coordination and absolute observance of a safety procedure. Depending on worksite location the setup for these tasks can take a significant amount of time and resources.
When electricity is not easily available, this can cause delays and lower overall turnaround productivity. Due to the frequent requirement to provide both breathing air and power tools for blinding and isolation tasks, a safety solutions company developed a highly portable breathing air system and a pneumatic power source for operating air tools in a small, mobile unit. The aim was to resolve these two sources of delay with an innovative equipment to lower considerably set up time for remote tasks and help improve turnaround efficiency.

The availability of breathing air. The portable breathing air unit provides up to 10 man hours of breathing air (1000 cu ft). Two people can be connected to breathing air at the same time. The air in the cart is class D breathing air that is fit for human consumption. There is an access panel for breathing air pressure settings. Stored pressure and user pressure gauges with pneumatic power auto shut off the system at 1000 psi ensures breathing air reserve is not compromised. As an added precaution, a low-pressure alarm at 500 psi will alert users that breathing air reserve is running low.

Powering pneumatic tools. There is a connection for one pneumatic power tool. The tool connection and the breathing air connections are different designs and not interchangeable making it impossible for these fittings to be mixed up. The unit is designed with backflow preventers so that air tool air cannot contaminate the breathing air supply. In the unlikely event the user depletes the breathing air supply while running the air tools, the air tool supply will shut down at 1000 PSI. This will leave the worker with about two man hours of breathing air. However, it is highly impossible for a worker to deplete the units breathing air supply using the air tools. However, configurations can be altered according to specific site requirements.

Mobility. With its narrow footprint and excellent maneuverability, the portable breathing air unit makes it ideal for constricted work areas. It has a platform to transport safely required gear to the work site. The handle can also be replaced with pintle hitch for towing.

**Presentation of Results**

Case Study of an Emergency Turnaround at a GTL facility in the Middle East

An emergency turnaround was called in a GTL facility in the Middle East due to a sudden drop in performance. The project was very time sensitive and could not afford stoppages. Five vessels needed to be entered at the same time and the lines and ducts connected to these vessels needed to be purged, blinded, and repaired. A total of 2,500 workers were onsite for 20 days that caused congestion and increased the risks of accidents during simultaneous operations such as purging and hot work. Previously, contractors needed to bring two pieces of equipment to blind a pipe or duct; a breathing air supply and a diesel air compressor to power pneumatic tools. They also needed to mobilize a forklift to transport these two equipment where needed and raise as necessary for working at heights. The plant management needed a solution that will lessen traffic and ease equipment deployment for short-duration tasks such as blinding and isolation.

Based on the plant’s previous problems with congestion during turnarounds, the need to hasten equipment deployment was highlighted. Three units of the portable breathing air unit that provides up to 30 man hours of breathing air, when combined...
were provided onsite. By using the equipment, the plant management eliminated four of the common sources of congestion and delay for blinding and isolation tasks. Firstly, the equipment served as a source of power for pneumatic tools that eliminated the need to bring a separate diesel air compressor. Secondly, since it was equipped with wheels, it also eliminated the need for a forklift that eliminated common risks associated with forklift accidents. Third, without mobilizing a forklift, there was no need to process a permit to work documents required when using heavy equipment. Fourth, only certified Breathing Air Technicians, the Foreman, and the General Foreman were allowed to manage the entire process. This eliminated unnecessary confusion when allocating personnel upon receipt of the job order for blinding tasks reached the safety provider.

It was the first time that the plant management has used such an innovation for their turnaround. The portable breathing air unit had only recently been deployed in the region, but none of the companies was eager to hire such services until otherwise proven to be effective. There were significant cost-savings from using this equipment, but the plant management was keen to feedback that what was most crucial for them was doing short-duration tasks more efficiently which saved them time and resources. The success of this turnaround reached other companies suffering the same turnaround problems in the Middle East.

Conclusion

During turnarounds, two of the most critical general tasks are blinding and deblinding for the protection and startup of the facility. These tasks are often high risk and can speed up or slow down subsequent tasks. An innovation was done and tested in the Middle East. The aim was to prove if the common logistical risks associated with these tasks, such as cluttered areas and moving heavy equipment can be eliminated. Allowing easy access and mobility will enhance productivity and reduce waiting time for the next tasks.

The innovation served as the solution that drove tasks to be done with speed and efficiency during a major Gas-To-Liquids emergency facility shutdown. Plant management and contractors saved time and cost with its two-in-one solution targeted at industrial shutdown and turnaround operations, specifically blinding operations that are critical and time sensitive. The equipment not only provided Grade D breathing air to the workers, but it also supplied the air required to power the pneumatic tools that are critical to installing and removing the blinds, valves and flanges connecting pipelines.