Installing Liquid Sulphur Degassing in Existing SRUs

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Introduction

Over the last 35 years more and more companies worldwide have installed liquid sulphur degassing processes in their Sulphur Recovery Units (SRUs) to minimize the dangers of the release of hydrogen sulphide (H_2S) from the produced elemental sulphur. H_2S which evolves from liquid sulphur can cause explosions in sulphur pits and sulphur storage tanks when the H_2S concentration in the vapor space reaches a critical concentration. Of equal concern are the potentially lethal hazards of H_2S exposure during the loading and transportation of sulphur.

Despite several serious safety incidents in sulphur tanks and pits in the United States in recent years, liquid sulphur degassing is not mandatory. This is in sharp contrast to Canada and Europe where there are regulations and guidelines for the maximum allowable H_2S concentration in liquid sulphur. These regulations typically apply to liquid sulphur when it is transported, either by rail, tanker truck or ship.

Over the past ten years there has been an ever-increasing focus on safety in the Hydrocarbon Processing industry. For those operators who do not already have liquid sulphur degassing capabilities, taking the steps to retrofit this technology into their plant is a positive move forward in safety stewardship. Liquid sulphur is one of the most transported hazardous materials in North America. There is a growing expectation that most of the SRUs in the United States will have to be retrofitted with liquid sulphur degassing in the near future. This eventuality should not be seen as a problematic challenge; the degassing technologies required for safe handling and transportation of liquid sulphur are already available and have a well-established track record in the industry.

Removing H_2S from Elemental Sulphur

SRUs convert H_2S from various sources into liquid sulphur. SRUs can be found in natural gas plants, refineries, coal gasification facilities and chemical plants. The produced sulphur from an SRU is chemically pure and used mostly to produce sulphuric acid. Research has shown that the H_2S in liquid sulphur exists

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as both H_2S_x (a series of polymeric compounds) and as dissolved H_2S[1]. As sulphur is condensed in the SRU, H_2S dissolves into the liquid sulphur while through complex chemistry H_2S_x is formed as well. These chemical mechanisms are functions of both the system temperature and the partial pressure of the H_2S above the liquid sulphur. The presence of the polysulphides has proven to be the limiting factor in the ability to successfully degas elemental sulphur.

There are five main reasons for removing H_2S from the produced elemental sulphur[2]:

1. Lowering the explosive hazard in sulphur storage and transportation.
2. Lowering the toxicity of the liquid sulphur during handling and transportation.
3. Lowering the corrosive nature of the liquid sulphur.
4. Reducing the emissions of H_2S to atmosphere.
5. Improving the physical characteristics of solid sulphur, either when blocked or formed for transportation.

When dissolved H_2S and polysulphides are not removed from the liquid sulphur, high concentrations of H_2S can be present in the vapor space above the liquid sulphur. When this vapor space is not well ventilated, there is an increased risk of an H_2S explosion during storage and during transportation. The Lower Explosion Limit (LEL) of H_2S in air is well documented and is typically between 3.7% and 4.3%, depending on the system temperature. Liquid sulphur is typically transported by rail/road truck and dedicated marine vessels. One of the first attributed H_2S explosion disasters occurred in 1963, when the liquid sulphur carrier Marine Sulphur Queen disappeared. Current understanding of the event suggests the ship was most likely lost as a result of a catastrophic explosion caused by H_2S evolving from the liquid sulphur, as only floating debris was ever found.

Since then, other incidents have been recorded, such as an explosion in a liquid sulphur tank in a Greek refinery in the 1980s that totally destroyed the tank. After that incident, liquid sulphur degassing prior to handling, storage and transportation became mandatory in Europe. The picture below shows the damage resulting from this explosion.

Figure 1. Destruction of sulphur tank at Greek refinery in the 1980s

A similar tank explosion also occurred in Texas in August of 2008 [3] In August 2016, a liquid sulphur storage tank was ruptured by an explosion at a refinery in California [4]. The resulting fire caused a release of sulphur dioxide that required local residents to shelter in place to minimize exposure to the hazardous gas release. We believe that this most recent incident vividly illustrates the potential risk that currently exists in most refineries and gas plants in the United States, as a large portion of these facilities are still storing undegassed sulphur in storage pits and tanks.

Tests have shown that degassing liquid sulphur to below a threshold level of 10 ppmwt H_2S and polysulphides prevents the formation of explosive mixtures in the vapor space above the sulphur. Precautions are still necessary even when degassing to this level, as there can be lethal concentrations of H_2S in the vapor space above the sulphur. As proof of the hazard, there are numerous examples in industry literature where H_2S released from elemental sulphur has resulted in fatalities.

The risks of storage, loading, transportation and unloading of liquid sulphur were characterized as the "forgotten hazard" in the 9th Global Conference on Process Safety in 2013 [5]. During the handling and loading of undegassed sulphur, in particular, personnel can be exposed to high concentrations of H_2S and potentially explosive mixtures can occur. The National Institute for Occupational Safety and Health (NIOSH) specifies an IDLH (immediately dangerous to life or health) concentration for hydrogen sulphide of 100 ppmv.

Degassing of liquid sulphur lowers the H_2S concentration above the liquid sulphur considerably and prevents the formation of an explosive atmosphere when it is stored or transported.

Sulphur Degassing Process

Several degassing processes are available in the market today that are able to degas liquid sulphur to below 10 ppmwt H_2S. Two of the most common technologies used in the industry today are the Shell Sulphur Degassing Technology and Fluor's D'GAASS process. There are some technologies which add a dispersed catalyst (such as ammonia or Quinoline) to aid in the degassing of sulphur (such as the SNEA, Chevron and Exxon Sulphur Degassing Processes) or technologies that use a contactor with a solid catalyst bed (such as the Amoco Degassing Process). More recently a new technology was developed by CSI called the ICOn degassing system. It utilizes a catalyst and a sparge gas to remove hydrogen sulphide from liquid sulphur.

This paper specifically focusses on the Shell Sulphur Degassing technology, however most of the conclusions that are made with respect to installing a sulphur degassing technology in an existing SRU also apply to the other technologies available that can be installed in or outside an existing sulphur pit.

Principles of Air-Based Sulphur Degassing Technologies

The sulphur produced in an SRU contains approximately overall 300-400 ppmwt H_2S. The H_2S is partially dissolved in the liquid sulphur as free H_2S and largely present as H_2S_x which is formed in the liquid sulphur during its condensation in the sulphur condensers [4]. The Shell Sulphur Degassing Process was developed to remove H_2S and H_2S_x from liquid sulphur to reduce the risk of the potential hazards associated with handling, transport and storage of undegassed liquid sulphur. The principle of sulphur degassing is to accelerate the decomposition of the polysulphides present via the injection of air into the liquid sulphur through spargers. This will partially strip the dissolved H_2S from the liquid sulphur and partially oxidize it to elemental sulphur according to the following reactions:

$$H_2S_x \rightarrow H_2S + S_{x-1}$$

$$H_2S + \frac{1}{2}O_2 \rightarrow \frac{1}{x}S_x + H_2O$$

By employing any air-based Sulphur Degassing technology, the intimate air contact with the sulphur results in a degassed product containing less than 10 ppmwt H_2S/H_2S_x.

It is worthwhile to note that as described in the paper by P.D. Clark and R. A Marriott [6)], the chemistry of degassing may be more complicated than described above, as lab analysis indicates that the chemistry also involves the reaction of H_2S_x with oxygen to form SO_2 and H_2O.

Process Description

Shell Sulphur Degassing Process

The Shell Sulphur Degassing Process can be installed in a sulphur pit, see Figure 2, or in a vessel either located in a concrete sump or above grade external to the sulphur pit, see Figure 3. This process description is specific to Shell Sulphur Degassing technology installed in a new vessel located downstream of an existing sulphur pit. The separate new vessel installation simplifies the revamp by avoiding potential process and mechanical integrity issues common to existing pits. The bubble columns required with this technology are difficult to retrofit in an existing sulphur pit. In addition, Comprimo believes that sulphur degassing in a vessel offers valuable advantages with respect to improved safety, reliability and ability to process the vent gas in the SRU Thermal Reactor.

The liquid sulphur from the SRU is pumped from the existing sulphur pit to the degassing vessel. In case the sulphur temperature in the pit is in excess of 300°F, the sulphur is cooled to a temperature below 300°F before entering the vessel (not shown). The liquid sulphur in the pit typically contains about 300 - 400 ppmwt H_2S.

Multiple bubble columns are installed in series in the stripping compartment of the degassing vessel. The bubble columns have a rectangular cross section with the top and bottom parts open. Air distribution spargers are provided in the bottom of the bubble columns.

The stripping air to the spargers is typically supplied by the SRU Main Air Blower. Other sources are also possible, such as Plant Air. The function of the air is to agitate the sulphur thereby forcing circulation in and around the bubble columns. This agitation promotes the stripping of the dissolved H_2S from the liquid sulphur and enhances the mass transfer of oxygen into the sulphur to oxidize the major part of the H_2S and H_2S_x to sulphur. Furthermore, the removal of H_2S from the sulphur promotes the decomposition of polysulphides. The end result is sulphur with an H_2S content of less than 10 ppmwt.

It is important to note that a chemical reaction between H_2S_x and oxygen can result in the formation of some SO_2 and H_2O [4)]. Experimental data shows the use of oxygen from the air is critical in sulphur degassing if catalysts are not used, as the rate of degassing decreases dramatically when nitrogen or other inert gases are used in place of air. It is also crucial that a steady flow of sweep air is maintained through the vapor space of the vessel. The sweep air prevents the formation of an explosive mixture by continuously removing the H_2S which is evolving from the liquid sulphur.

The degassed sulphur flows from the degassing compartment into the storage compartment of the vessel, over an internal weir into a storage compartment. Sulphur Pumps then transfer the degassed sulphur to external storage either continuously or in batch mode.

The total air fed to the degassing vessel, combined with the H_2S released from the liquid sulphur, flows either to the thermal oxidizer or is recycled back to the front end of the SRU. The destination will depend upon the local emission restrictions. Recycling the H_2S laden air back to the SRU front end requires some increase in pressure to compensate for the process pressure drop across the SRU. There are two typical approaches to achieve the necessary air stream pressure. One method is to pressurize the degassing vessel, using either utility air or compressed at with a minimum pressure of 20 psig, as this will have the added benefit of improving the mass transfer of air into the sulphur. This directly translates into reducing the residence time and the vessel sizing required. Alternately, an ejector can be incorporated to draw the air using a higher-pressure motive fluid (such as MP steam) to create sufficient head for the recycle. The main impacts of using a steam ejector are a slight reduction in processing capacity of the SRU due to the steam load and a slight reduction in the Thermal Reactor temperature. Typically, these items do not result in substantial impacts, however, need to be evaluated on a case-by-case basis. There is no impact on sulphur recovery efficiency.

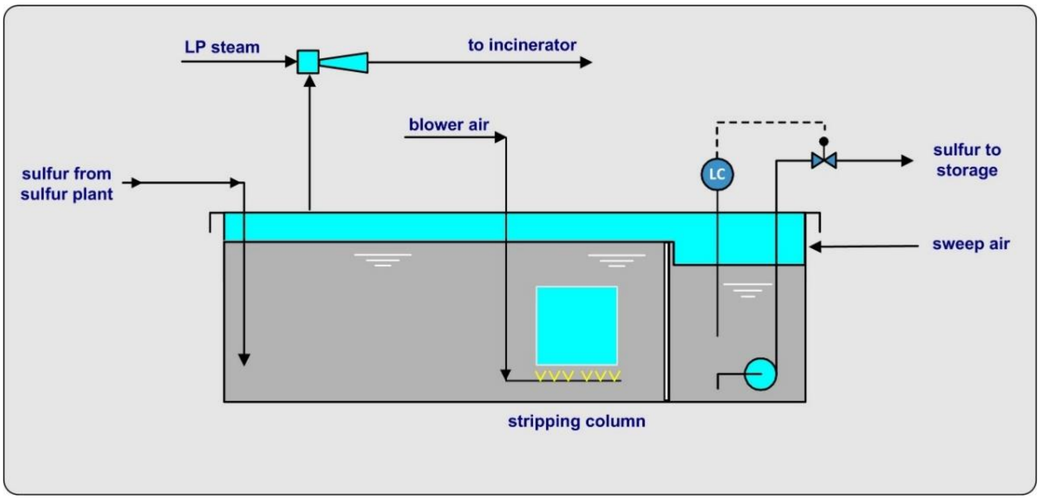

Figure 2. Shell Sulphur Degassing in an (existing) sulphur pit

A sulphur cooler may be required in the sulphur rundown (in the case of a sulphur pit) or in the transfer line to the sulphur degassing vessel to ensure that the sulphur viscosity is low enough to maintain proper agitation in the bubble columns and promote the decomposition of H_2S_x.

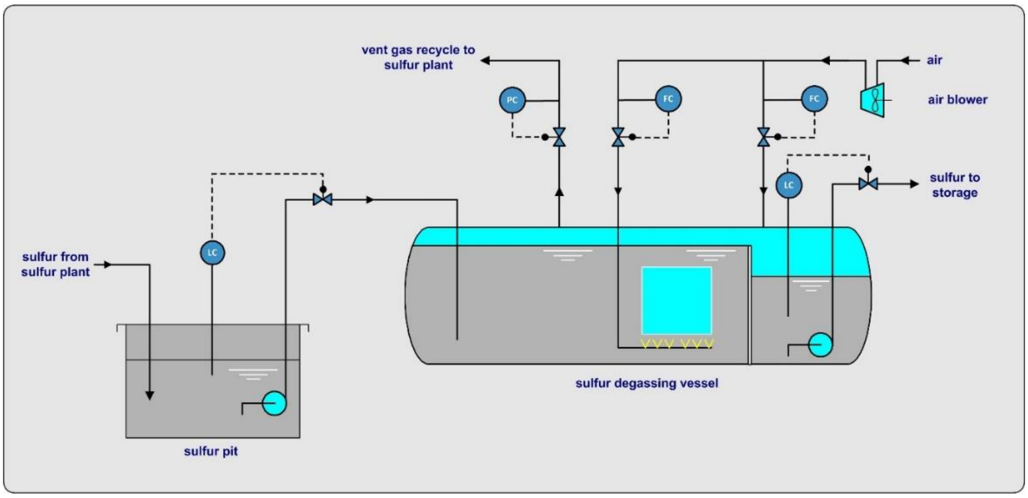

Figure 3. Shell Sulphur Degassing in a separate vessel

D'GAASS Process

Degasification with the D'GAASS Process is accomplished in a pressurized vertical vessel that contacts undegassed sulphur with pressurized process air. The contactor vessel may be located at any convenient location. Undegassed sulphur is pumped to the vessel and intimately contacted with air across special fixed vessel internals.

The degassed sulphur is under pressure and can be sent to storage or directly to loading. Operation at elevated pressure allows the overhead vapor stream from the degassing unit to be routed to the traditional thermal incinerator location, or the sulphur recovery unit main burner or tail gas cleanup unit line burner – thus eliminating the degassing unit as an SO_2 emission source.

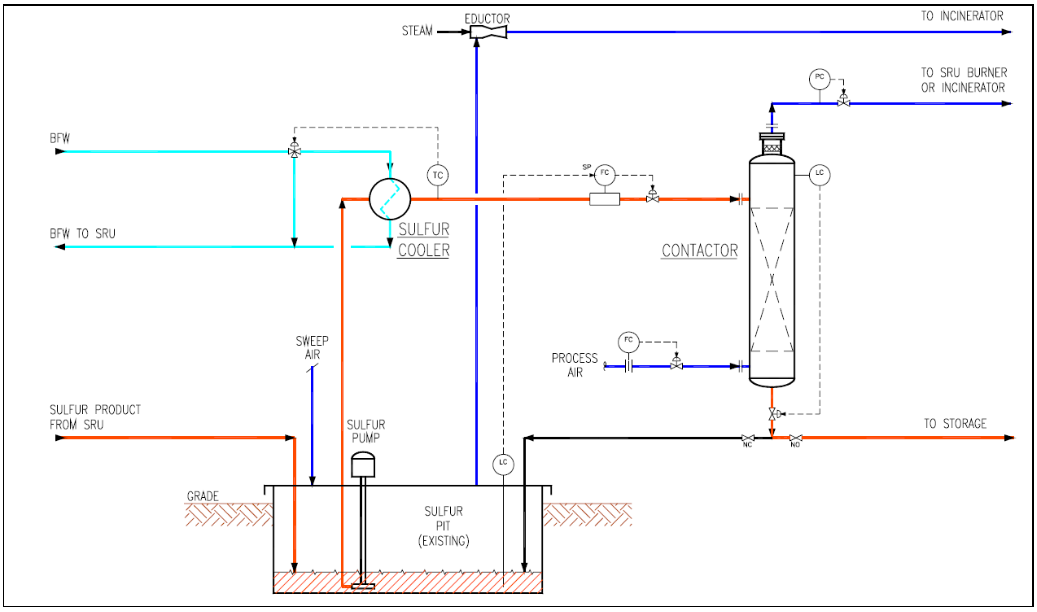

Figure 4. D'GAASS Process

ICOn Process

The ICOn degassing system utilizes a catalyst and a sparge gas to remove hydrogen sulphide from liquid sulphur. Liquid sulphur from the first two or three condensers flows through respective sulphur sealing devices into a sulphur cooler in order to reduce the sulphur temperature below the viscosity transition point. From the cooler, the sulphur flows to the degassing contactor, which contains the degassing catalyst. Due to the relatively sulphur low flow rate and hydrogen sulphide content produced in the last one or two condensers, sulphur from these condensers does not typically require treating. Sparge gas, typically taken from and returned to the tail gas line, is fed to the degassing contactor via a steam ejector.

The degassing reaction which occurs in the contactor produces liquid sulphur which, when combined in the sulphur pit with the untreated sulphur from the downstream one or two condensers, yields an aggregate H_2S content of less than 10 ppm. Sulphur sealing devices are required before and after the contactor to contain the SRU condenser vapor, degassing vapor, and pit vapor within their respective equipment.

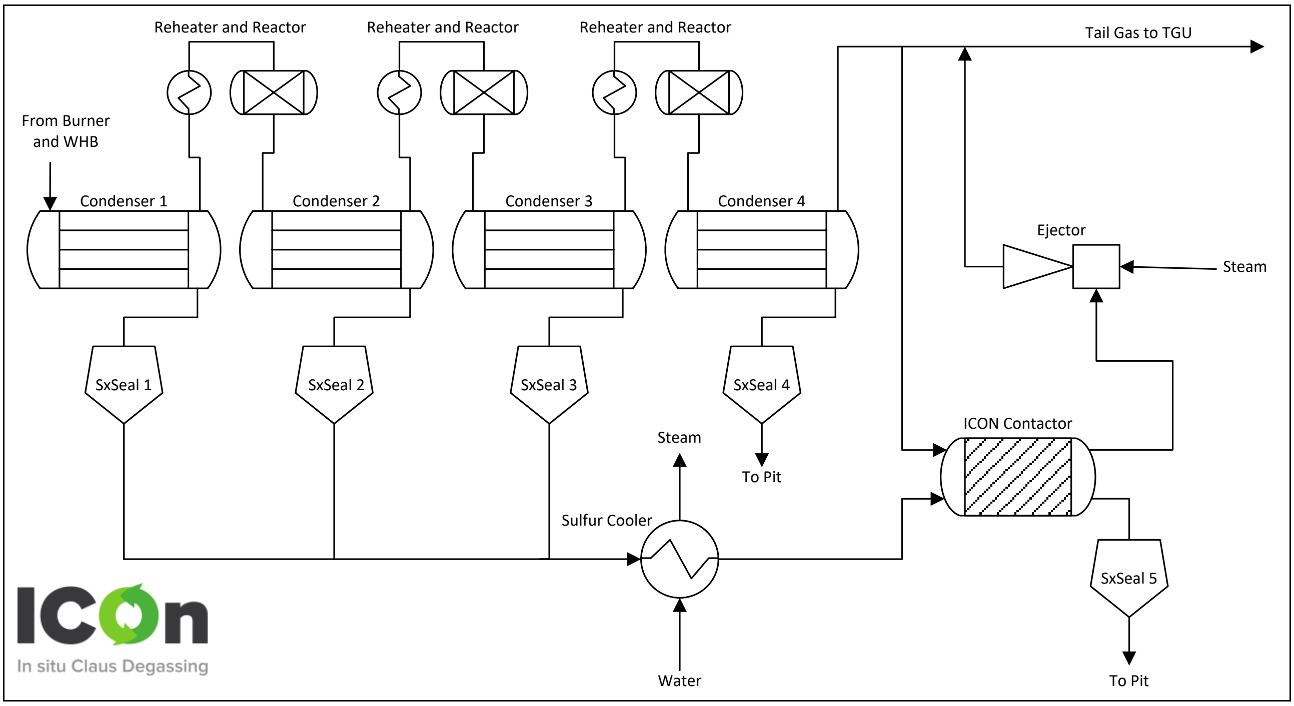

Figure 5. ICOn Process

Integrating Liquid Sulphur Degassing into Existing Facilities

Most facilities in the US have a sulphur pit, where the produced liquid sulphur is collected. The collected sulphur is pumped to a sulphur storage tank with a residence time of typically 5-10 days. From the storage tank the sulphur is loaded into rail tankers, road tankers or pumped into a liquid sulphur barge. Alternatively, the liquid sulphur can be sent to a solidification facility, where pellets or flakes are produced. The vapor space of the sulphur pit is swept with air by ejectors and the resulting vent gas is discharged either to the Thermal Oxidizer or the Main Burner. Most sulphur tanks have chimneys on the roof to ventilate the vapor space directly to the atmosphere. Some tanks have a nitrogen blanket on top of the liquid sulphur, mitigating ingress of oxygen to prevent an explosion. However, based on the history of explosions in sulphur storage tanks and industrial accidents resulting from high H_2S concentrations in the vapor space of sulphur trucks and rail cars, the absence of sulphur degassing in these facilities has proven to result in dangerous situations.

Sulphur is considered a byproduct of gas treating and oil refining. Although it may be a chemically pure product, sulphur prices have historically been very low. For many owners, liquid sulphur is not a consistently valuable or profitable commodity. Therefore, investment in degassing technology does not translate into a more valuable sulphur product. Instead, the decision to install liquid sulphur degassing technology is typically driven by the following criteria:

- Improving unit safety by reducing explosion risks.
- Satisfying emission regulations.

When the permitted emissions are already stringent or are expected to become more stringent in the near future, the sulphur degassing technology design needs to make allowance for this possible development. The vent gas from the degassing vessel contains sulphur components (H_2S, SO_2, S_v, S_l), which, when routed to the Thermal Oxidizer, will result in increased sulphur emissions. Routing the vent gas back to the SRU Thermal Reactor should be considered, as it will reduce the sulphur emissions from the SRU and enable reducing the size of the degassing unit due to the improved kinetics of the conversion of the polysulphides to H_2S.

The degassing design should inherently prevent H_2S explosions during operation. When feasible, it is preferred to have a skid mounted unit or have the unit constructed off-site to minimize the impact of construction activities within an operating plant. There are inherent risks when constructing in an operating SRU, primarily due to the sour gas hazards.

Retrofit Options

There are several options available to implement sulphur degassing technology in an existing facility depending on the installed equipment conditions and infrastructure available. To evaluate the different options available for retrofitting to a sulphur degassing technology, the following considerations were made:

- Little or no interruption to the processing facility operation.
- Minimizing implementation costs.
- Safety in all phases of engineering from design to installation to final operation.

For the Shell Sulphur Degassing Technology, the following configurations may be considered:

- Retrofitting the existing sulphur pit with Shell Sulphur Degassing Technology.
- Retrofitting the existing sulphur pit to hold a new sulphur degassing vessel.
- Install a new below-grade sulphur degassing vessel.
- Install a new above-grade sulphur degassing vessel.

Retrofitting the Existing Sulphur Pit with Shell Sulphur Degassing Technology

This is typically the most cost-effective degassing revamp solution, provided that:

- The existing sulphur pit has proven mechanical integrity (specifically with respect to the concrete, steam coils, and ejector system). In recent literature[7)] corrosion mechanisms have been described which are responsible for compromising the integrity of the concrete sulphur pit walls and covers. Prior to proceeding with the degassing revamp, it is important to confirm the extent of any corrosion within the pit.
- Sulphur pit dimensions are adequate to install the required internals for sulphur degassing.
- Modifications can be carried out in the available turn-around period to minimize impact on plant operations.

In the case of retrofitting an existing sulphur pit to Shell Sulphur Degassing Technology, the first step is to determine how many bubble columns are required to meet the 10 ppmwt H_2S specification in the degassed sulphur product. The number of bubble columns is a function of the total sulphur feed to the sulphur pit and the total available residence time for degassing. Designs normally vary between two and five bubble columns. An evaluation of the overall pit dimensions is required for two main objectives: firstly, to determine if the pit will have sufficient residence time (9-14 hours without pumping section depending on the sulphur production capacity) to meet the required degassing specifications, and secondly to see if the layout of the pit allows for the installation of the bubble columns, as the existing sulphur pit may be too shallow or there may be internals impeding the installation of the bubble columns. The existing capacity of the combustion air blowers, and if already present on the sulphur pit, the pit vent gas ejectors, need to be evaluated for the new higher air flow required. The air flow should be sufficient to achieve both the degassing performance and to maintain the H_2S concentration in the vapor space of the sulphur pit below 25% of the LEL of H_2S in air. During normal operation, the H_2S concentration in the vapor space will be well below 1%.

If the conditions above cannot be achieved, then it is not possible to implement the Shell Sulphur Degassing Technology in the existing sulphur pit. The next best option is to degas in a new sulphur degassing vessel.

Installing a New Below-grade Sulphur Degassing Vessel

In situations where retrofitting the existing sulphur pit is not possible, one may consider installing a below-grade sulphur degassing vessel instead. When the dimensions of the existing sulphur pit are large enough to install a sulphur vessel inside, the sulphur pit may be modified by removing both the pit cover and the internals during a turnaround. Essentially the existing sulphur pit is then converted to a below grade concrete sump to contain the sulphur vessel. In case the existing sulphur pit cannot be converted, it can also be considered to install a new concrete sump near to the existing SRU to install a new below grade sulphur degassing vessel. In that case, sufficient plot space has to be available near the existing sulphur pit to allow the sulphur to be rerouted to the new vessel, with the civil work being executed in a running plant.

It is preferred to design the vessel with external steam heating to prevent introduction of steam/water into the vessel. In addition, all air streams shall be preheated to prevent condensation of water in the vessel which can lead to increased corrosion.

The new vessel can be completely dressed outside of the operating area of the sulphur plant and will contain between two and five bubble columns, depending on the capacity of the unit and required degassing level. The air to the spargers of the bubble column can be supplied from the existing combustion air blowers or another source of air that may be available. Depending on the local regulations for overall sulphur recovery requirements, the vent gas from the sulphur degassing vessel can be routed either to the existing Thermal Oxidizer or to the SRU Thermal Reactor. Since the sulphur degassing vessel replaces the sulphur pit for the collection of the produced sulphur in the SRU, the new vessel cannot be operated at elevated pressure and ejectors are still required to move the off gases. In order to route the vent gases to the SRU thermal reactor, a motive fluid will need to be selected for the ejectors to produce a higher discharge pressure to gain entry into the thermal reactor.

New vertical sulphur pumps will need to be installed in the vessel to transfer the degassed sulphur product to the existing sulphur storage or loading facilities.

The following activities can be planned for outside the turnaround period in a running plant:

- New sulphur rundown lines.
- Tie-in(s) for vent gas line and liquid sulphur.
- Sparger air piping using Main blower air, if applicable.
- Tie-in for utilities such as steam, instrument air, utility stations.
- Civil works for foundations.
- Lines on (existing) pipe racks.
- Civil work for a new concrete sump (if necessary).

These activities have to be planned carefully to minimize down-time and not to affect the operating plant.

Installing a New Above-grade Sulphur Degassing Vessel

One final option that can be considered for the installation of sulphur degassing in the processing facility is the installation of a new above-grade sulphur degassing vessel, which is fed from an existing sulphur pit or collection vessel. The installation of the above-grade vessel can be done with the unit in operation and can be tied-in during a regular turnaround. The liquid sulphur from the sulphur pit will be pumped to the new vessel and the degassed sulphur is routed from the vessel to the existing liquid sulphur storage or handling facilities. The key advantages of installing an above grade sulphur degassing vessel are:

- No excavation to construct a concrete sump or entry into an existing pit is required.
- In case a sulphur cooler is required, it can be installed as a conventional shell and tube exchanger above grade.
- External horizontal fully jacketed sulphur pumps (which are easier to access and maintain) can be installed instead of vertical sulphur pumps.
- The sulphur degassing vessel can be installed anywhere in the processing facility.

This option may be the most economical in cases where multiple SRUs operate in one facility. The sulphur degassing vessel can be installed in a central location relative to the SRUs and the vent gas from the vessel could be routed to several locations, depending on the environmental requirements and the required reliability of the system. Also, depending on the regulatory requirements, the vessel may have to be designed and operated under sufficient pressure to be able to route the vent gases to the SRU thermal reactors. In this case, a new air blower most likely would need to be installed to supply the degassing and sweep air to the pressurized vessel if insufficient plant air is available in the facility. Some additional capital and operating cost increases need to be considered for this. If routing the vent gases to the thermal oxidizer is permitted, the existing combustion air blowers may be suitable to supply the air. This design does not require the installation of ejectors.

Such a vessel can be completely outfitted with all instrumentation, platforms and other attachments outside the operating area of the sulphur plant and there should be limited impact to operations during the construction of the degassing vessel. Alternatively, the option exists to design and build the entire degassing unit as a modularized unit in a fabrication shop.

To prepare the new sulphur degassing vessel for connection to the existing equipment/piping, the following activities need to be executed in the running plant:

- Tie-ins to the liquid sulphur line.
- Tie-in(s) for the vent gas line.
- Main blower air piping or installation of a new air blower, if applicable.
- Tie-in for utilities such as steam, instrument air, utility stations.
- Civil works for foundations of the vessel and rotating equipment before the vessel is transported to its final location.

- Lines in (existing) pipe racks have to be installed.
- Tie-in to existing electrical systems.
- Instrumentation has to be connected to existing systems.
- Safeguarding has to be integrated with the existing systems.

The installation of a new above-grade sulphur degassing vessel will have the least impact on operation and the planning and installation can be organized around any turnaround.

Modifications to Sulphur Storage and Handling

Once the processing facility has installed sulphur degassing in its SRUs, the produced sulphur that is routed to the sulphur tanks and sulphur loading stations will contain less than 10 ppmwt H_2S. This may or may not have an impact on the venting requirements for the existing sulphur tanks. When storing undegassed sulphur, it is recommended to maintain sufficient sweep air flow in the tank to keep the H_2S concentration in the vapor space below 1%, which corresponds to less than 25% of the LEL for H_2S. This is typically accomplished by the installation of multiple heated air intakes at the edge of the tank roof and a heated central vent stack which is sometimes equipped with ejectors. Through natural or induced draft a continuous sweep is maintained through the tank. The sweep air rates are a function of the air temperature in the vapor space of the tank, the difference in elevation between the intakes and the vent stack and the hydraulic losses across the nozzles. In the design of this system, items such as pump-in and pump-out of sulphur need to be considered, as well as the effect of ambient conditions on the amount of natural draft that can be sustained.

When an existing sulphur tank is converted from undegassed sulphur to degassed sulphur operation, the presence of a natural draft system may result in an increased formation of SO_2 in the vapor space of the tank, which could lead to additional emissions. It is Comprimo's standard practice to design all of the degassed sulphur storage tanks with a venting system that minimizes the sweep. This is done by installing three jacketed or bolt-on jacketed vent stacks at equidistant locations at the same elevation on the roof of the tank, without the installation of a central vent stack. This allows the H_2S, which is still released in small quantities from the degassed sulphur, to react with the oxygen present in the vapor space. But it also minimizes the formation of SO_2, which typically occurs with a continuous flow of air over the sulphur surface in the tank. If the local regulations do not allow the emission of any H_2S or SO_2 from the sulphur tank, the installation of an induced draft sweep air system may have to be considered. This requires the installation of air or steam driven ejectors to direct the sweep air either to the thermal oxidizer or to the SRU thermal reactor.

If is it necessary to alternate between storing undegassed and degassed sulphur in the tanks, a system could be developed where the operator has the option to open or close the central vent stack and operate the tank as a naturally swept or just vented system. But there are inherent risks in a system with these changing modes of operation. When revamping an existing tank, it is recommended to perform calculations for all expected conditions to determine whether the sweep air rates are adequate to maintain the H_2S concentration below 25% of the LEL. In this evaluation, the tank vapor space temperature plays a critical role and thermal models as described in the article by Hornbaker et al [8] may have to be employed to predict this temperature. In addition, Computational Fluid Dynamics (CFD) modelling may be required to determine whether the existing sweep air system is able to eliminate any pockets of higher H_2S concentration zones from the vapor space.

Summary

The storage, loading/unloading, and transportation of liquid sulphur are still considered to be the forgotten hazard in the sulphur industry in the United States. Especially with the handling and loading of undegassed sulphur, personnel can be exposed to high concentrations of H_2S, and potentially explosive mixtures can occur in the vapor space of the storage vessels. Sulphur degassing technology greatly reduces the dangers of undegassed liquid sulphur. This article has provided several options available to the industry to retrofit the technology with minimal impact on existing operations. These options can be customized to accommodate the local environmental regulations and plant specific infrastructure, leading to a safer and more reliable SRU operation. There is no longer a reason to risk explosions or hazardous circumstances during the handling and transportation of liquid sulphur as a straightforward and well proven solutions are readily available.

Interested or have any questions? We're ready to help.

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