Interactive Information Packet

Sulfur Operations Support Inc.

Your source for Sulfur Recovery Solutions

PRODUCTS

VARIOUS SULTRAP DESIGNS
LOOKBOXES
SULVIEWS
PRESSURE SURGE DEVICE
JACKETED PIPING
COLLECTION HEADERS
HEAT TRACE INSULATION

SERVICES

CONSULTING
TROUBLESHOOTING
INSPECTION
TRAINING
ENGINEERING
FIELD ENGINEERING
MECHANICAL/PIPING DESIGN
3D CADWORX PLANT DESIGN
VESSEL/PIPING FABRICATION
JACKETED PIPE FABRICATION

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Sultrap™

(Patented and Proprietary Technology of SOS, Inc.)

Our flagship product, since its inception in 1988, the Sultrap™ has set the standard for sulfur recovery units by replacing old, traditional seal legs. The Sultrap is a fully customizable sulfur sealing system, with seemingly endless variations designed exclusively per client's needs.
SOS uses only 100% 316L S.S. and full 100% steam jacketing on all jacketed equipment. We believe, based on years of experience, this jacketing type is the best heating system for this process application.
We are the first to pioneer this above-ground sulfur sealing system. With over 25 years of experience and 2000+ units in service worldwide, we are able to perfect the Sultrap of today.

The following is a brief summary of reasons as to why seal legs are being replaced by Sultraps.

Ease of Maintenance:

- Traditional seal legs can extend down into the ground for up to 10 meters. When one of the tubes experience a plug, leak, or any problems, it becomes a major undertaking to repair. Before this can be done, the sulfur recovery unit must be shut down. This can result in loss of production.

- The Sultraps can be maintained without being removed from the piping. Maintenance is so easy that closing the inlet valve will allow operations personnel to clean the internal basket strainer in 5 minutes.

Safety:

- As described above, the operator can close the inlet valve, de-pressurize the Sultrap, then open and clean the internal basket safely.

- The old seal design requires closing the inlet valve, removing the top flange, and then rod out the long dip tube that the sulfur drains through. This cumbersome procedure increases hazards to the crew.

- This is precisely the reason why the Sultrap was invented.

Menu

Installation:

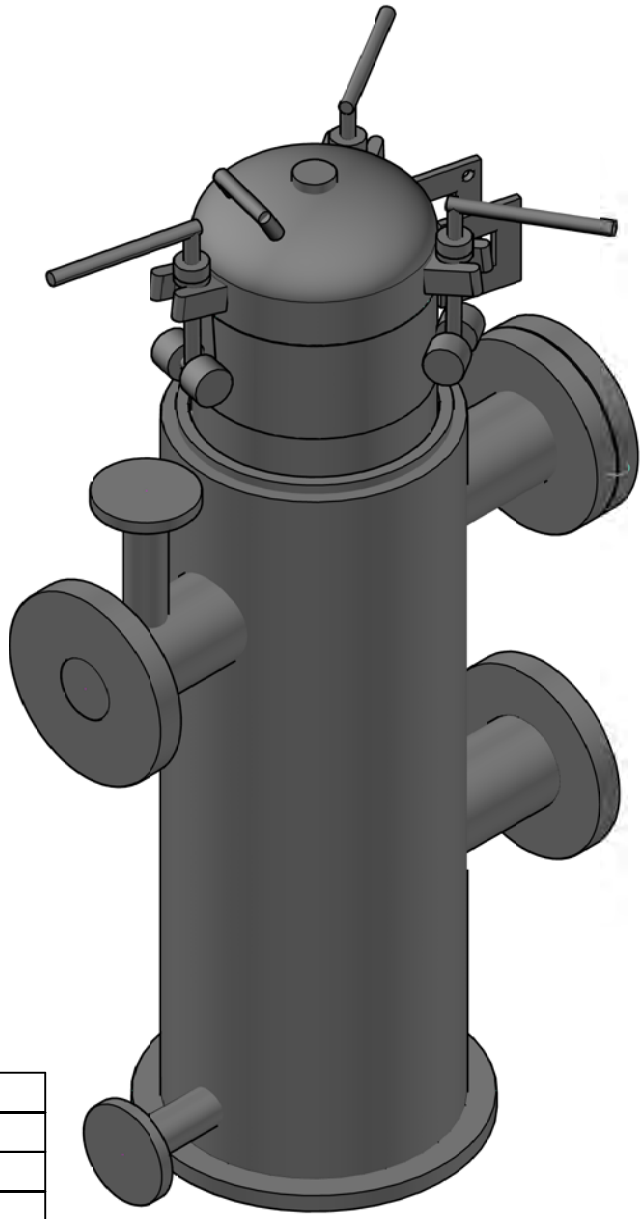
- Installing large, deep seal legs requires digging deep into the ground, installing a casing, and then the actual system can be installed.

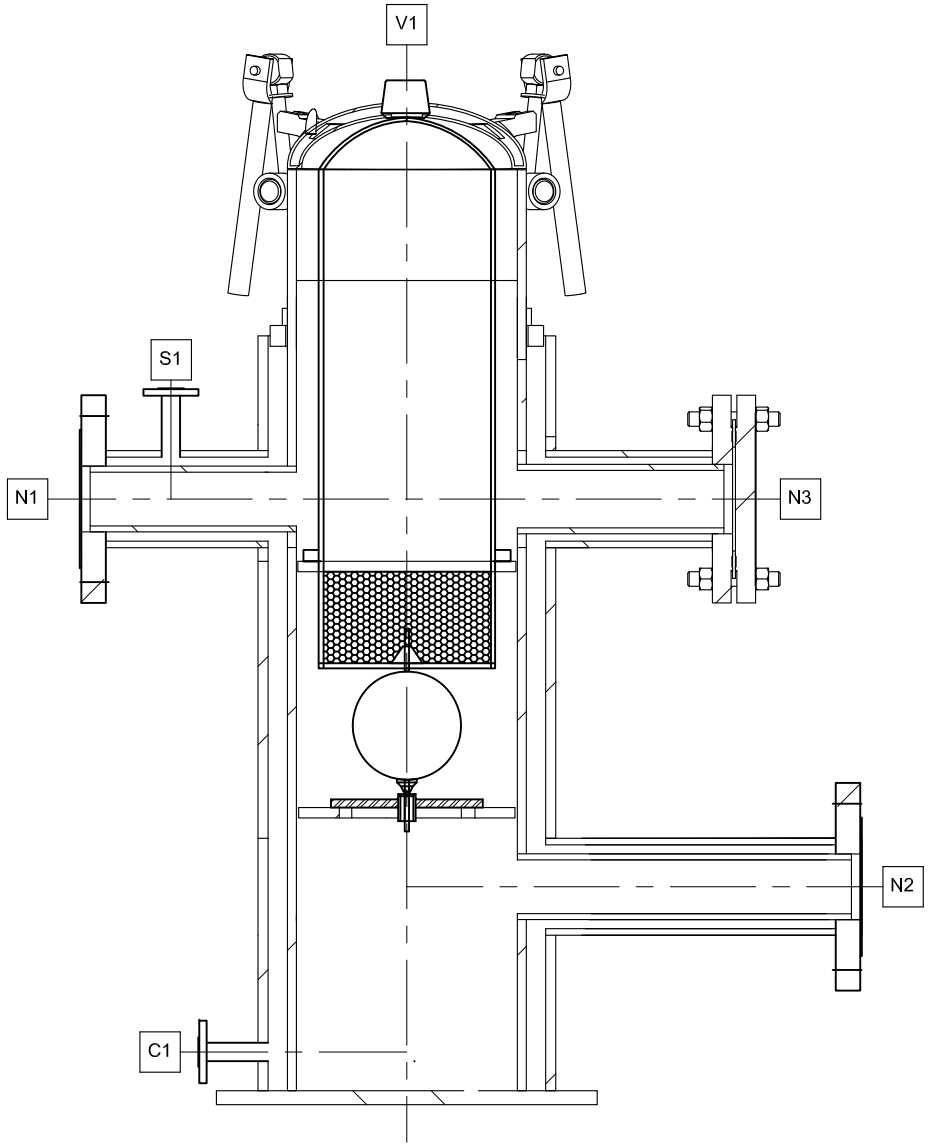
- The Sultrap is installed above ground, eliminating the need for invasive in-ground concrete structures and piping.

We have worked with plants to fully eliminate their in-ground sulfur storage systems. Installing large concrete structures in the ground is costly and is inviting future problems such as water ingression. When all the costs are included, the Sultrap is no more expensive than the seal legs with casing. They provide a long-term solution to maintenance problems and safety. The Sultrap is customized to the client's needs and can be enhanced with Sulview Sightports, Lookbox, Pressure Surge Relief Device or combined into a Collection Header.

In conclusion, every plant/refinery that has installed Sultraps, have continued to come back time and again to utilize these devices in their new plants and when retro-fitting their old plants. The costs to benefits are clear. The Sultrap can meet almost any piping configuration, has a proven internal design, is highly costeffective, and is entirely customizable per client's needs.

For a more detailed discussion on how we can tailor the right Sultrap for you, call us at 1-228-875-5515. We look forward to hearing from you and serving your needs.





MARK	QTY	SERVICE
V1	1	Vent w/Plug
S1	1	Steam In
C1	1	Condensate Out
N3	1	Rod Out w/Blind
N2	1	Sulfur Outlet
N1	1	Sulfur Inlet

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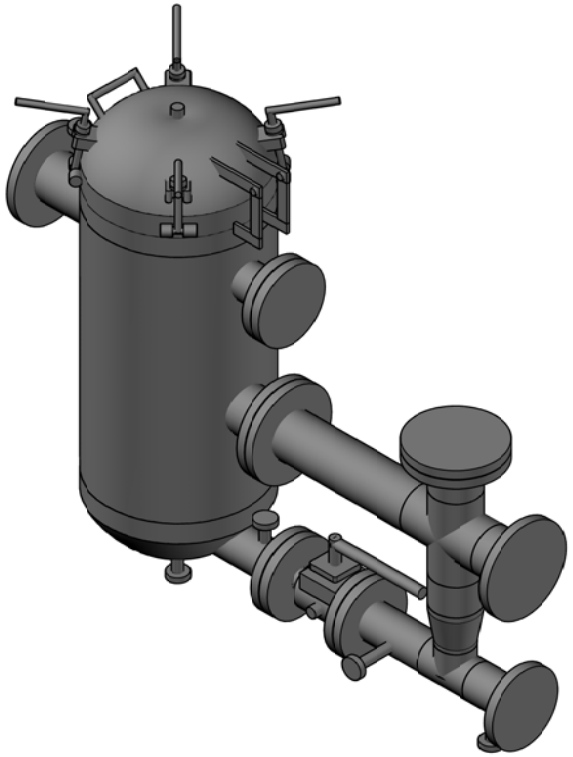
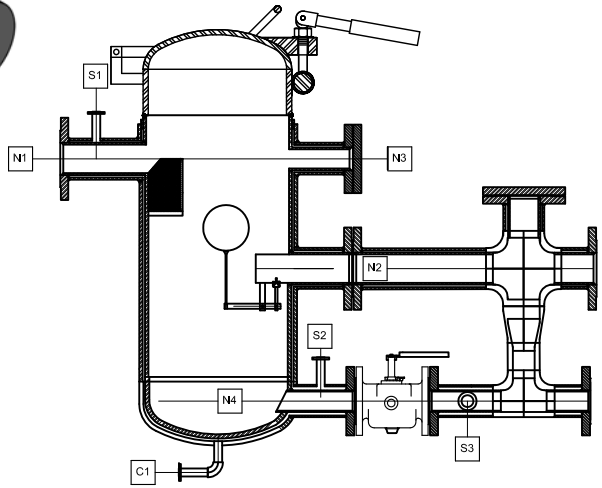
Sulfur Operations Support

SULTRAP CLASSIC





ELEVATION

MARK	QTY	SERVICE
S3	1	Steam In/Out
S2	1	Steam Out
S1	1	Steam In
C1	1	Condensate Out
N4	1	Bypass/Drain
N3	1	Rod Out W/Bld
N2	1	Sulfur Outlet
N1	1	Sulfur Inlet

NOTES:

1. SAME BENEFITS OF ORIGINAL SULTRAP DESIGN.
2. ALL MATERIALS OF CONSTRUCTION ARE 316L S.S.
3. 100% JACKETED
4. BYPASS VALVE INCLUDING DRAINING CAPABILITIES, ELIMINATING THE NEED FOR A SEPARATE DRAIN LINE.
5. FILTER BASKET THAT ALLOWS OVERFLOW CAPABILITY AND LARGE MATERIAL TO SETTLE OUT WITH BOTTOM DRAIN.
6. PATENTED FULCRUM FLOAT MECHANISM DESIGN. PATENT # 9216372
7. PRESSURE SURGE DEVICE (IF REQUESTED)
8. OPTIONAL IMPROVED SULVIEW DESIGN (INTEGRATED STEAM JACKETING TO PREVENT SULFUR BUILD UP ON THE SIGHT GLASS, PATENT PENDING)
9. ALL DIMENSIONS AND NOZZLE ORIENTATIONS ARE FULLY CUSTOMIZABLE PER CLIENT'S REQUIREMENTS.
10. ALL MODELS HAVE OPTIONAL VAPOR BY-PASS

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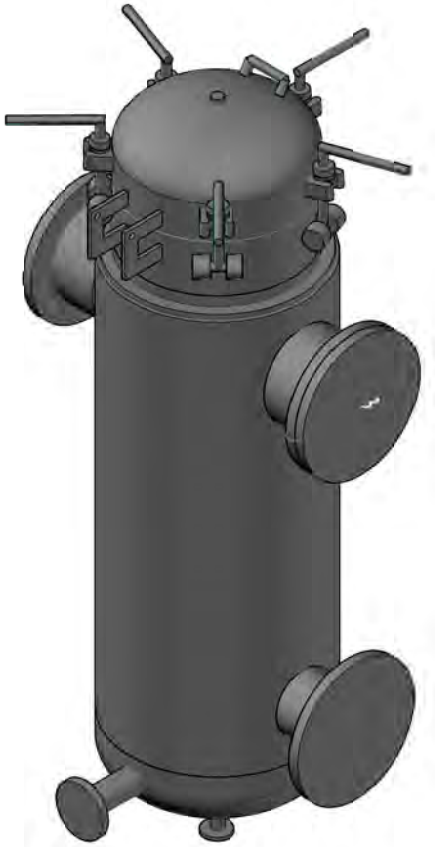
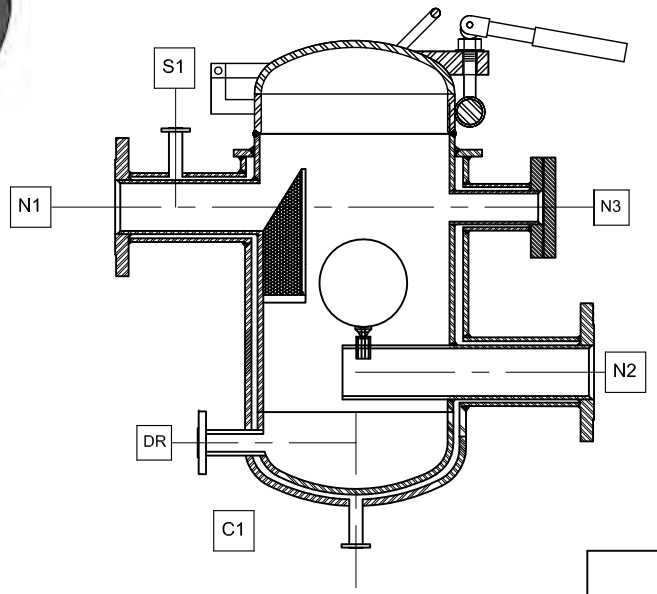
Sulfur Operations Support

SULTRAP 100 A/B





NOTES:

1. SAME BENEFITS OF ORIGINAL SULTRAP DESIGN.
2. ALL MATERIALS OF CONSTRUCTION ARE 316L S.S.
3. 100% JACKETED
4. FILTER BASKET THAT ALLOWS OVERFLOW CAPABILITY
5. LARGE ARE AT THE BOTTOM TO ALLOW MATERIAL TO SETTLE OUT WITH BOTTOM DRAIN AND VALVE THAT CAN ALSO BE USED TO DEPRESSURIZE THE VESSEL.
6. PRESSURE SURGE DEVICE (IF REQUESTED)
7. OPTIONAL IMPROVED SULVIEW DESIGN (INTEGRATED STEAM JACKETING TO PREVENT SULFUR BUILD UP ON THE SIGHT GLASS, PATENT PENDING)
8. ALL DIMENSIONS AND NOZZLE ORIENTATIONS ARE FULLY CUSTOMIZABLE PER CLIENT'S REQUIREMENTS.

MARK	QTY	SERVICE
DR	1	Sulfur Drain
S1	1	Steam In
C1	1	Condensate Out
N3	1	Rod Out w/Blind
N2	1	Sulfur Outlet
N1	1	Sulfur Inlet

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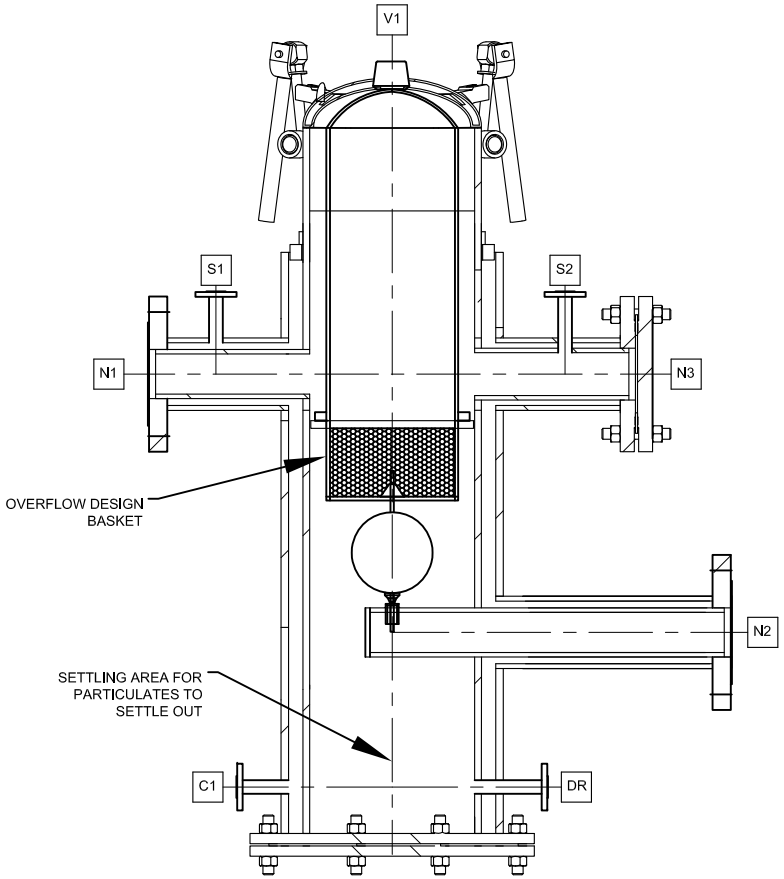
Sulfur Operations Support

SULTRAP 200 A/B



MARK	QTY	SERVICE
DR	1	Optional Drain
V1	1	Vent w/Plug
S2	1	Steam Clean out (Optional)
S1	1	Steam In
C1	1	Condensate Out
N3	1	Rod Out w/Blind
N2	1	Sulfur Outlet
N1	1	Sulfur Inlet

NOTES:

1. SAME BENEFITS OF THE CLASSIC SULTRAP DESIGN.
2. ALL MATERIALS OF CONSTRUCTION ARE 316L S.S.
3. 100% JACKETED
4. FILTER BASKET TO FILTER OUT SOLIDS THE BASKET IS AN OVERFLOW DESING TO ALLOW SULFUR TO OVERFLOW AND SETTLE AT THE BOTTOM IF THE BASKET GETS CLOGGED
5. LARGE AREA AT THE BOTTOM TO ALLOW MATERIAL TO SETTLE OUT WITH BOTTOM DRAIN AND VALVE THAT CAN ALSO BE USED TO DEPRESSURIZE THE VESSEL.
6. PRESSURE SURGE DEVICE (IF REQUESTED)
7. OPTIONAL IMPROVED SULVIEW DESIGN (INTEGRATED STEAM JACKETING TO PREVENT SULFUR BUILD UP ON THE SIGHT GLASS, PATENT PENDING)
8. ALL DIMENSIONS AND NOZZLE ORIENTATIONS ARE FULLY CUSTOMIZABLE PER CLIENT'S REQUIREMENTS.

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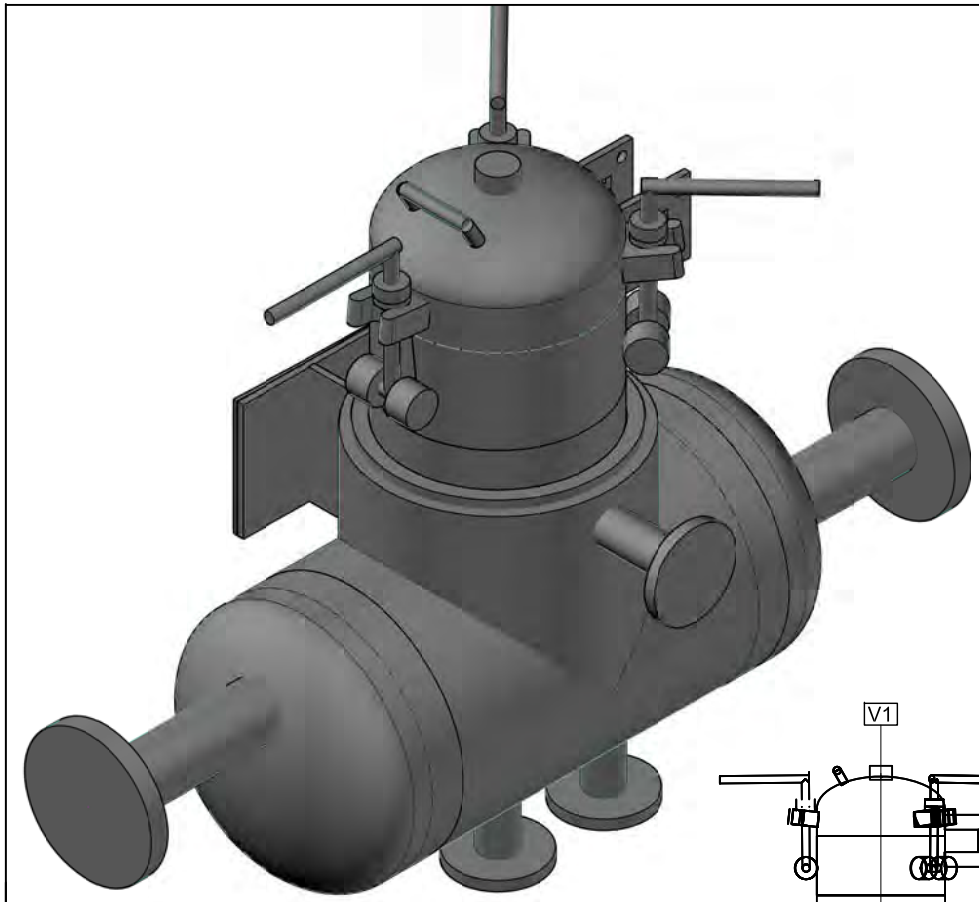
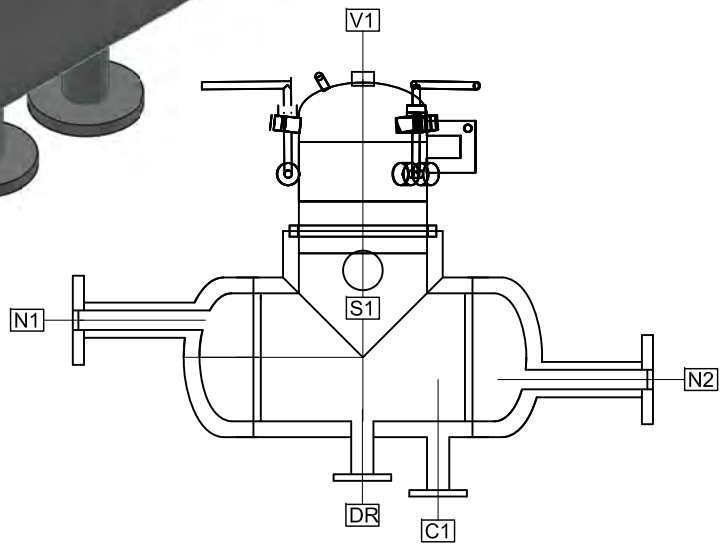
Sulfur Operations Support

SULTRAP 201 A/B





MARK	QTY	SERVICE
V1	1	Vent w/Plug
DR	1	Sulfur Drain
S1	1	Steam In
C1	1	Condensate Out
N2	1	Sulfur Outlet
N1	1	Sulfur Inlet

NOTES:

1. SAME BENEFITS OF ORIGINAL SULTRAP DESIGN.
2. ALL MATERIALS OF CONSTRUCTION ARE 316L S.S.
3. 100% JACKETED
4. FILTER BASKET THAT ALLOWS OVERFLOW CAPABILITY AND LARGE MATERIAL TO SETTLE OUT WITH BOTTOM DRAIN.
5. PATENTED FULCRUM FLOAT MECHANISM DESIGN. PATENT # 9216372 OR STANDARD ORIFICE SEAT DESIGN.
6. PRESSURE SURGE DEVICE (IF REQUESTED)
7. IMPROVED SULVIEW DESIGN (INTEGRATED STEAM JACKETING TO PREVENT SULFUR BUILD UP ON THE SIGHT GLASS)
8. DESIGN ALLOWS FOR SITUATIONS WHERE THERE IS LIMITED CENTERLINE TO CENTERLINE ELEVATION DIFFERENCE FROM OUTLET NOZZLE TO INLET NOZZLE.
9. ALL DIMENSIONS AND NOZZLE ORIENTATIONS ARE FULLY CUSTOMIZABLE PER CLIENT'S REQUIREMENTS.
10. ALL MODELS HAVE OPTIONAL VAPOR BY-PASS

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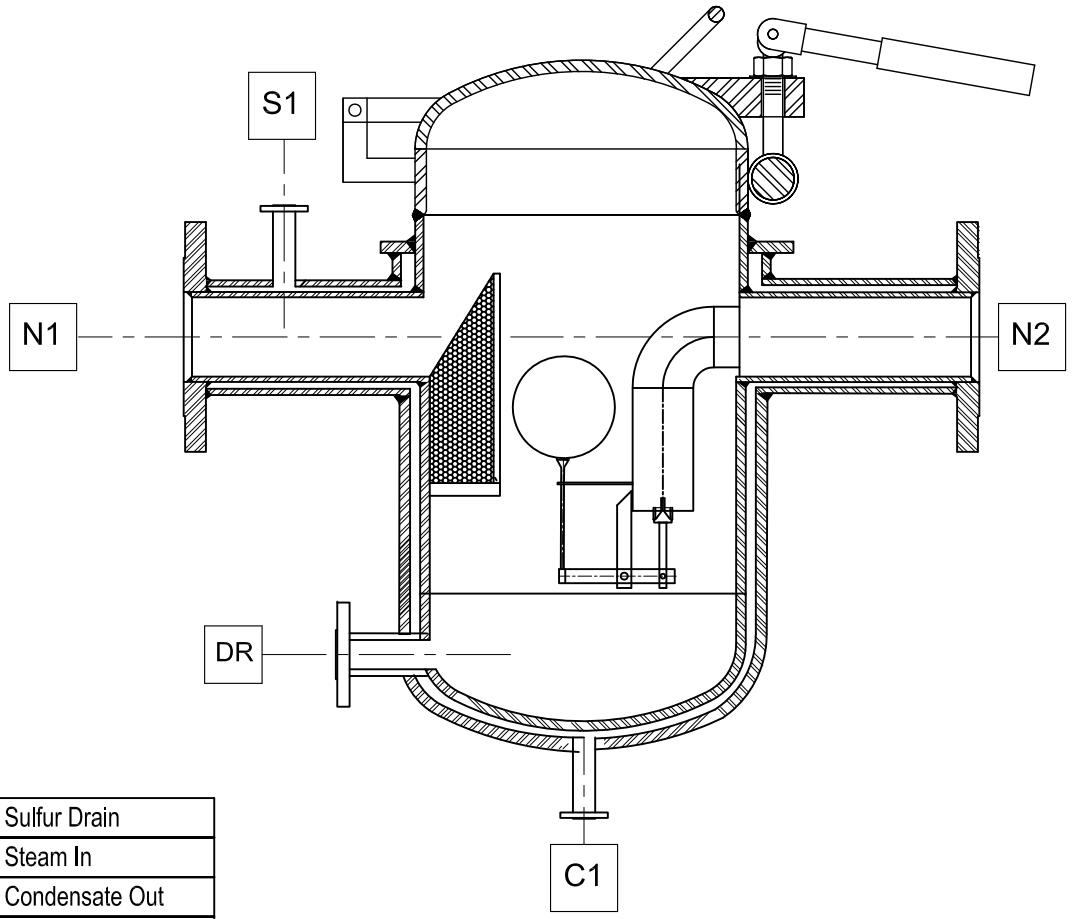
Sulfur Operations Support

SULTRAP 300



MARK	QTY	SERVICE
DR	1	Sulfur Drain
S1	1	Steam In
C1	1	Condensate Out
N2	1	Sulfur Outlet
N1	1	Sulfur Inlet

NOTES:

1. SAME BENEFITS OF ORIGINAL SULTRAP DESIGN.
2. ALL MATERIALS OF CONSTRUCTION ARE 316L STAINLESS STEEL .
3. 100% JACKETED
4. LARGE ARE AT THE BOTTOM TO ALLOW MATERIAL TO SETTLE OUT WITH BOTTOM DRAIN AND VALVE THAT CAN ALSO BE USED TO DEPRESSURIZE THE VESSEL.
5. PATENTED FULCRUM FLOAT MECHANISM DESIGN. PATENT # 9216372
6. WITH THIS DESIGN THE SULFUR LEVEL IS ALWAYS ABOVE THE ORIFICE OUTLET WHICH ELIMINATES GASSES FROM ESCAPING.
7. PRESSURE SURGE DEVICE (IF REQUESTED)
8. OPTIONAL IMPROVED SULVIEW DESIGN (INTEGRATED STEAM JACKETING TO PREVENT SULFUR BUILD UP ON THE SIGHT GLASS, PATENT PENDING)
9. DESIGN ALLOWS FOR SITUATIONS WHERE THERE IS LIMITED OR NO CENTERLINE TO CENTERLINE ELEVATION DIFFERENCE FROM OUTLET NOZZLE TO INLET NOZZLE.
10. ALL DIMENSIONS AND NOZZLE ORIENTATIONS ARE FULLY CUSTOMIZABLE PER CLIENT'S REQUIREMENTS.
11. ALL MODELS HAVE OPTIONAL VAPOR BY-PASS

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Sulfur Operations Support

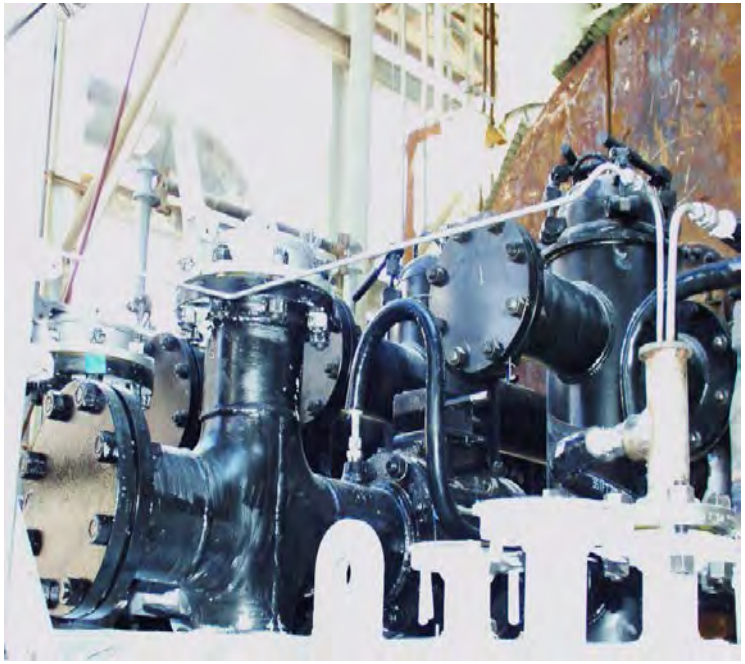
SULTRAP 400 A/B

Sulfur seal legs tend to plug frequently, resulting in:

- Excessive down time
- Hazardous conditions
- Ground contamination due to constant sulfur spills
- Costly repairs

Sulfur Operations Support

Sultrap™ is the SOLUTION to underground sulfur seal legs.



- Requires **no electrical** or pneumatic assistance
- Requires **no digging** and is entirely above ground
- **ASME** coded and steam jacketed
- **Cost-effective** in the long term

Sulfur Operations Support

Advantages of Sultrap™

- **Ease of Installation**
  - Installed above ground, eliminating the need for invasive in-ground concrete structures and piping.
- **Ease of Maintenance**
  - Maintained without removal from piping and internal basket can be cleaned within a few minutes.
- **Increased Safety**
  - Operator can safely clean internal components, simply by closing the inlet valve and de-pressurizing the Sultrap™.
- **Customizable**
  - Built per client's specs, with many variations and augments to choose from

Sulfur Operations Support

Sultrap™ Design

- **Filter System**
  - Front-end perforated basket strainer to collect and prevent particulates from settling to the bottom
- **Pressure Safety Release**
  - API pressure relief device per client's request
  - Equipped with internal/external pressure bypass piping to equalize pressure for inspections or maintenance
- **Heating**
  - 100% steam jacketed
- **Fabrication**
  - 100% 316L Stainless Steel used for all fabricated equipment

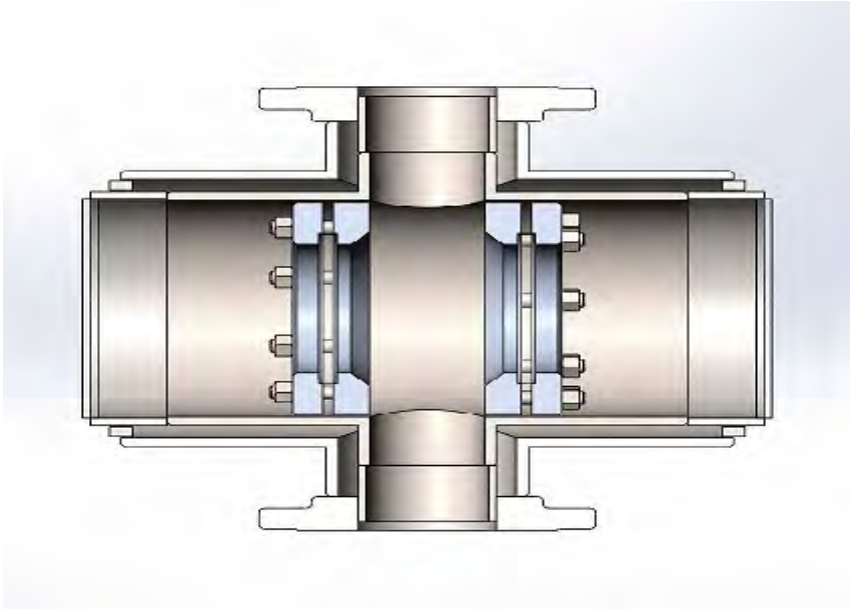
Sulfur Operations Support

Sulview Sightport and Lookbox

(Sulview is Patented and Propietary Technology of SOS, Inc.)

The Sulview sightport is an augment to the Sultrap™. It provides a constant, unobstructed vision of the sulfur flow content. As a result, operations personnel will be able to make effective and efficient adjustments without incurring safety hazards.

The Sulview houses a steam coil that distributes heat between the interior and exterior glasses. This effect will prevent sulfur fogging and/or water vapor condensation on the lens, allowing a clear view of the the piping internals.



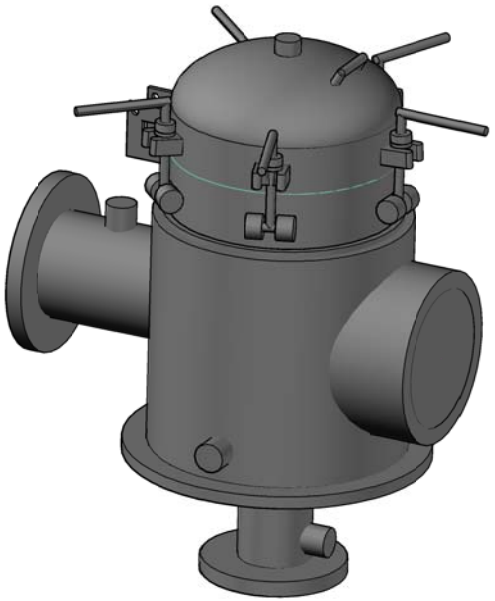
The device can be bolted on horizontally, either on the body of the Sultrap™ or flange, or vertically on the inlet valve.

The glass windows can withstand up to 125psi. Inner glass can be removed for inspection and maintenance.

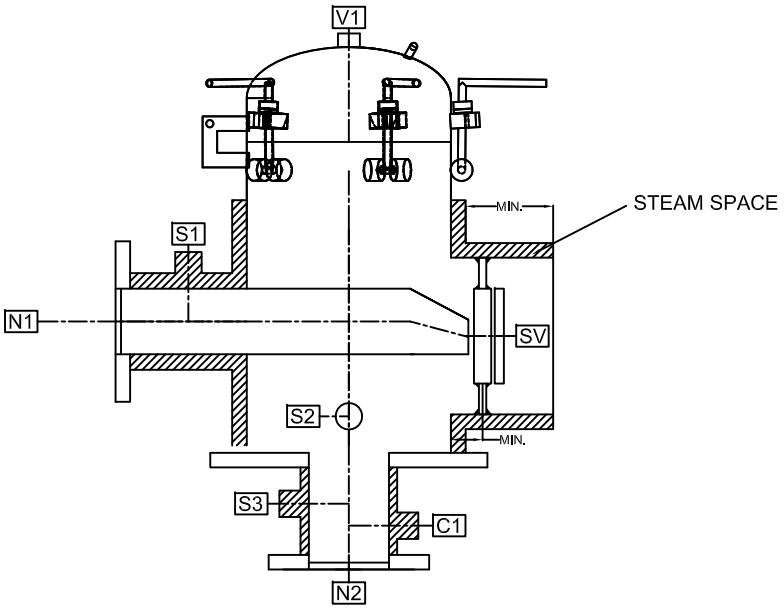
To further increase visibility, optional interior lights can be added.

Visual samples not enough? You can take physical samples with the Lookbox. We can modify or add a top access lide to your Sultrap™, Sulview sightport, or flange for physical inspetion and examination of the contents.

An alternative option of the Lookbox is our vapor-free sampling system in the outlet line. With this system, small samples of the flow content are diverted to a convenient area for clients to sample.



SULVIEW/LOOKBOX



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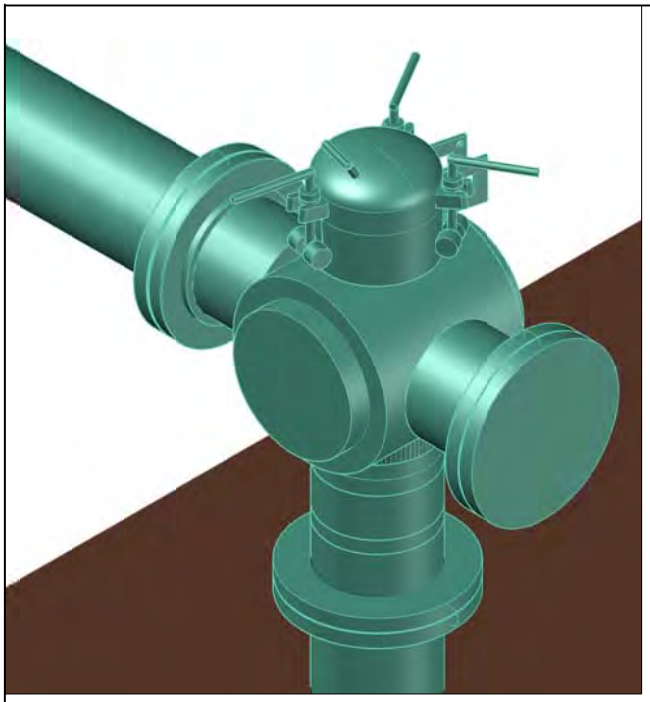
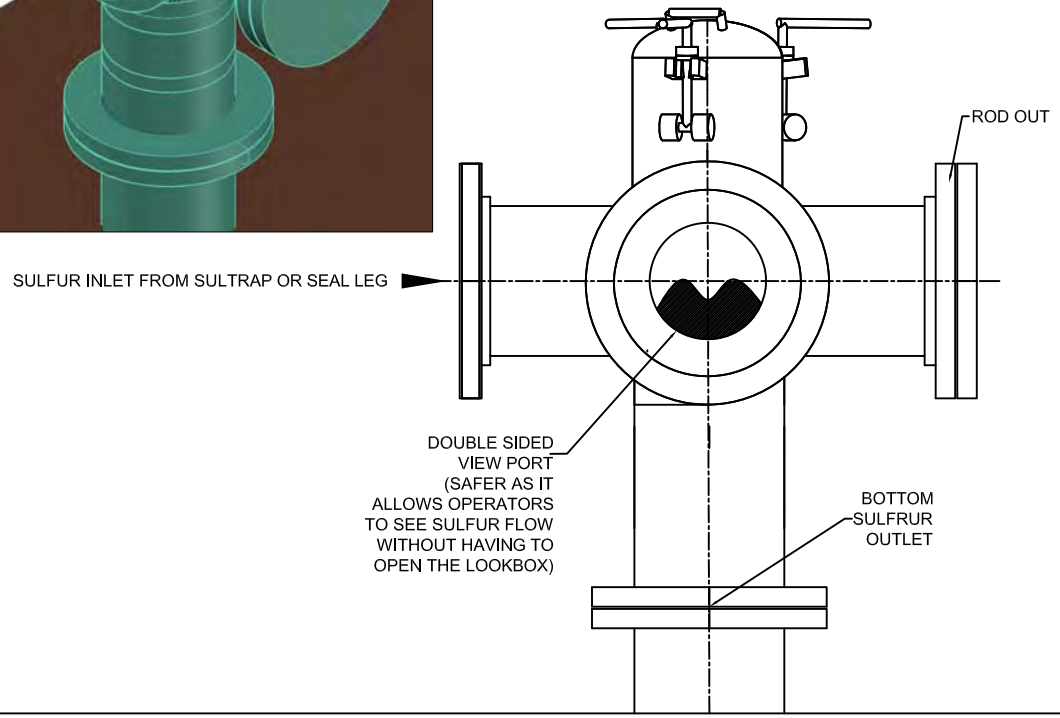
Sulfur Operations Support

SULVIEW_BOX 100





NOTES:

1. SAME BENEFITS OF ORIGINAL LOOKBOX DESIGN.
2. ALL MATERIALS OF CONSTRUCTION ARE 316L STAINLESS STEEL .
3. 100% JACKETED
4. THE DESIGN COMBINES OUR PATENTED SULVIEW DESIGN WITH A LOOKBOX.
5. THE DESIGN HAS A DOUBLE SIDED VIEWING GLASS THAT ALLOWS THE OPERATOR TO VIEW THE SULFUR FLOW DOWNSTREAM OF THE SULTRAP WITHOUT HAVING TO OPEN THE VESSEL. BECAUSE OF THIS, IT IS A SAFER ALTERNATIVE TO THE STANDARD LOOKBOX.
6. THE DESIGN STILL HAS A T-BOLT QUICK OPENING LID FOR INTERNAL ACCESS FOR SAMPLING OR CLEANING.
7. THE DESIGN IS AVAILABLE IN A BOTTOM OUTLET (SHOWN IN PICTURE), HORIZONTAL INLET AND OUTLET, OR A STRAIGHT FLOW THROUGH DESIGN.
8. ALL DIMENSIONS AND NOZZLE ORIENTATIONS ARE FULLY CUSTOMIZABLE PER CLIENT'S REQUIREMENTS.

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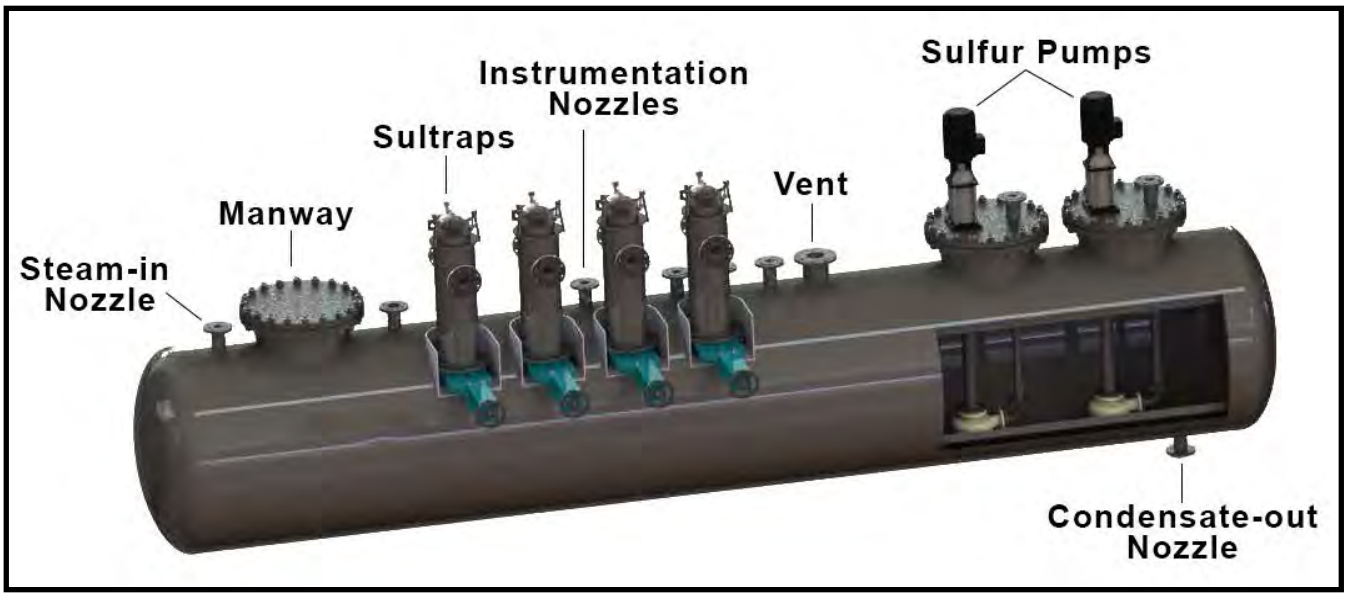
Sulfur Operations Support

SULVIEW_BOX 200

Collection Header



Underground sulfur pits within the sulfur recovery units can and will result in immense costs for repairs and maintenance. The potential for escaping gases and noxious fumes at grade level can impact the safety of personnel and create envrionmental concerns. In the event of underground pit failures, clients are faced with placing personnel into hazardous situations below ground to perform cleaning, repairs, and inspections.

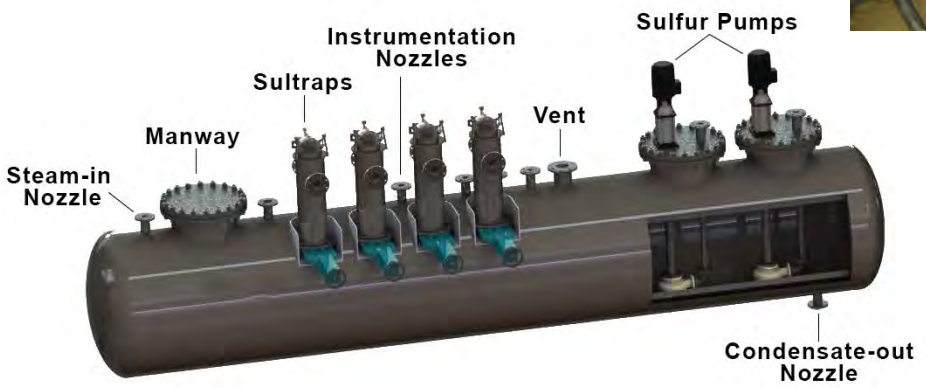
The Collection Headers can collect sulfur throughout the integral Sultrap™ for continous online pump out for degassing (if required) to off-site storage. The SOS Collection Header can be provided with micro-bubble dffusers for degassing of the sulfur. Addtional options include 100% jacketing, bolt-on heating panels, or our patented Reflective Insulation.

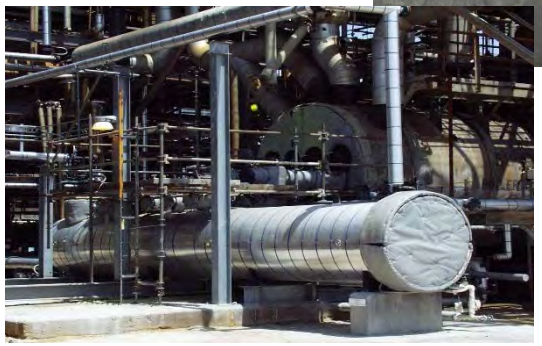
For retrofit installations, there are very minimal piping changes. For new installations, the Collection Header would eliminate the requirement for extensive and costly civil work.

- Nothing below ground level, including the Sulfur pit
- Replaces failing sulfur pits
- More Cost-effective than continued concrete repairs
- Easy to retrofit existing plant
- Option for internal Air Degassing. (Ask for more details on our Degassing Technology)
- Fully enclosed; No escaping gases to activate H2S alarms, local corrosion, and operator complaints

More solutions to common sulfur recovery concerns

- **Sulfur storage pit failures**
  - Corrosion can damage sulfur pits and invite more problems
  - Potential escaping gases and noxious fumes to grade level
  - Maintenance for failing sulfur pits are hazardous and difficult





- **Collection header**
  - Above ground and collects sulfur throughout the integral Sultraps for degassing to off-site storage
  - Minimal piping changes for retrofit installations

Sulfur Operations Support

Pressure Surge Relief Device (PSRD)

(Patented and Propietary Technology of SOS, Inc.)

SOS developed the PSRD to provide a large volume relief to an over-pressurized Sultrap in the sulfur recovery industry; however, the mechanism has applications in many industries.

The top chamber has a nitrogen/instrument air (IA) pad and the gas pressure is supplied through a small insrument back pressure regulator. The set pressure is based on the overall cross section area between the top plate and the seat cross section area of the lower plug.

For example: if the lower plug has a diameter of 4 inches, the upper plate would have a diameter of 6 inches. If the design pressure for relief is 20 psig, then nitrogen/IA pad would have a chamber pressure of 9 psig.

If pressure falls below the relief point, the upper chamber would maintain a downward force on the seal to prevent pressure from the inlet to escape. If pressure rises above the relief point, the shaft would rise, allowing gas to escape and exit. Once the pressure is below the relief point again, the cycle continues.

Key Benefits:

- does not rely on springs
- Internal shaft can be removed for inspection
- Upper plate re-seals itself
- Fully-steamed jacketed

The upper plate has a maximum travel of 1 inch. In the upper chamber, the upper plate has small weep holes that allow a small volume of nitrogen/IA to continuously purge the relief chamber and exit out the pressure through the nozzle.

The total relief area = (circumference of the lower plug * the 1 inch rise). A 4 inch diameter plug would have a circumference of 12.5 area of open upon a 1 inch rise. Most relief systems that can permit this area are rupture systems that cannot reseal themselves.

The seals indicated are AFLAS material; however, the material selection is based on operating parameters.

Sulfur Dioxide Injection

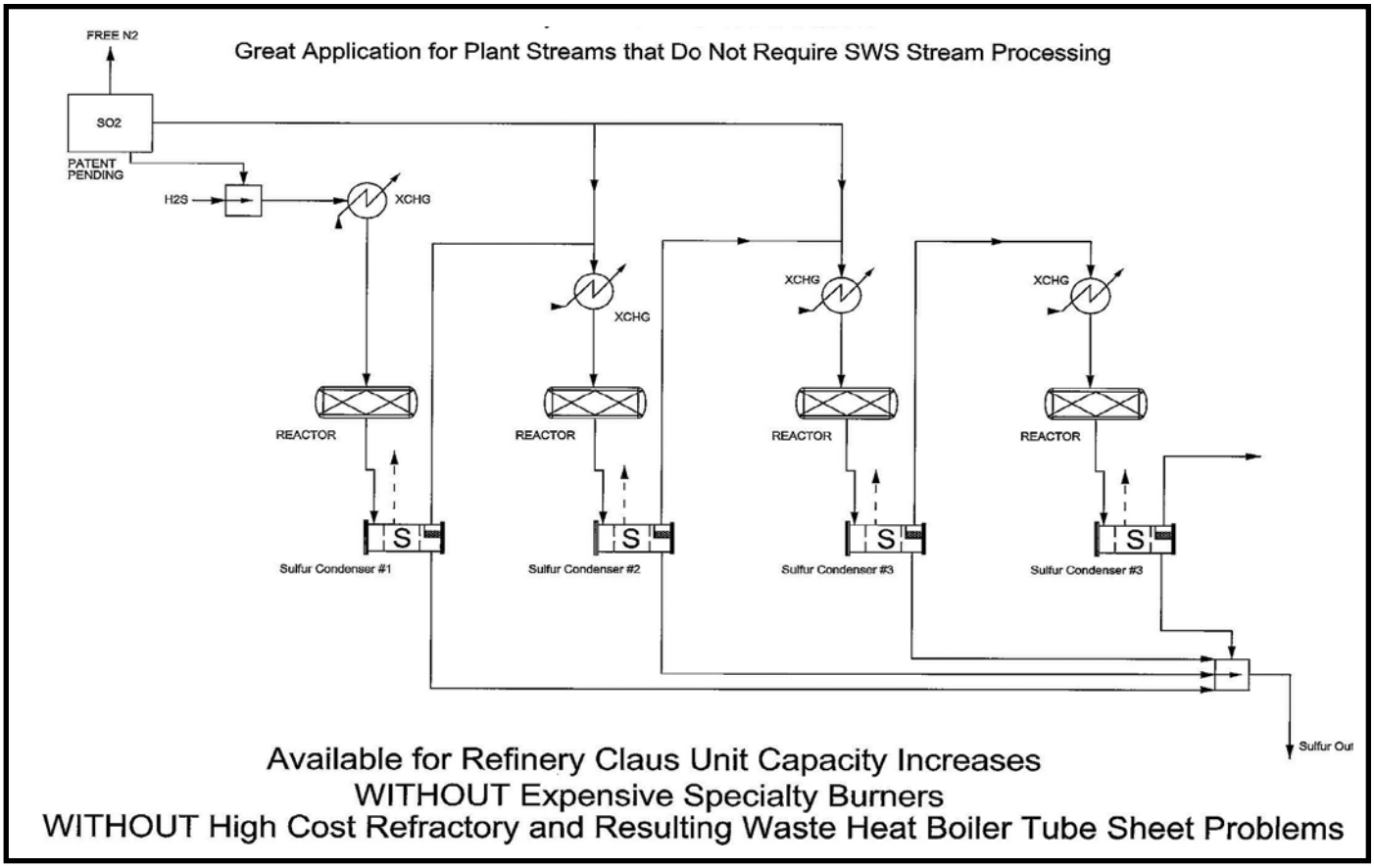
(Patented Process and Propietary Technology of SOS, Inc.)

Sulfur dioxide can be produced externally and injected into a thermal reactor, reaction vessel, or at any location where hydrogen sulfide is present. This process can significantly increase the capacity of a Claus and tail gas unit.

This procedure also reduces the cost for new plant sulfur recovery unit applications by eliminating the need for additional thermal reactors, large waste heat boilers, and traditional re-heaters. The SO2 is produced by a unique processing unit that also provides high qualiy nitrogen for use on-site at no extra cost.

The advanced no-monia process will allow clients to process large volumes of sour water stripper gas without major modifications to the current sulfur recovery unit.

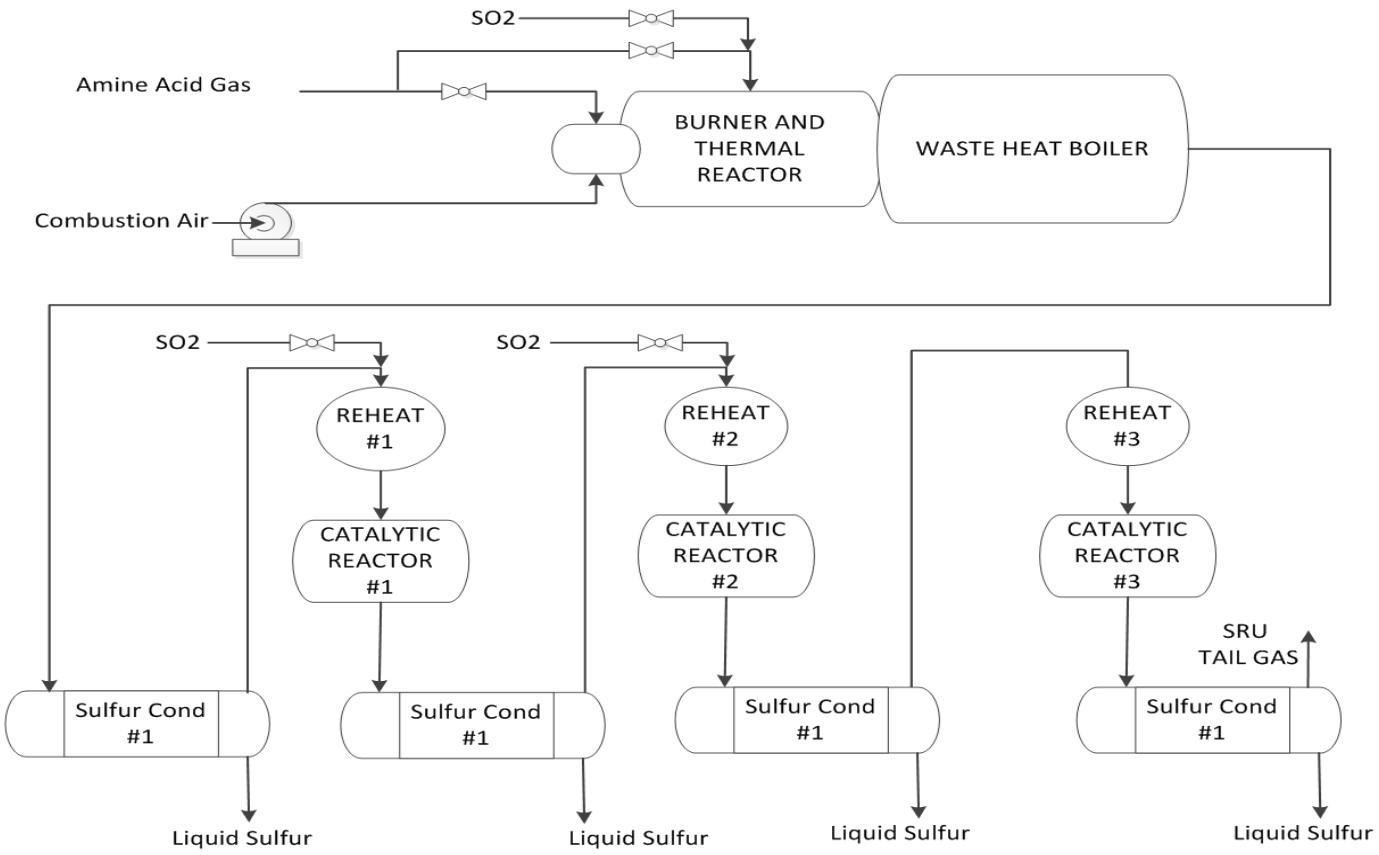
- Multi-point SO2 injection in SRUs increases capacity with minnimum modifications and provides flexibility for performance optimization
- SO2 generation is proven technology
- Cost savings for SRU Thermal Stage Equipment



The Sultrap™ is a Patented and Proprietary Technology of Sulfur Operations Support, Inc. The Sulfur Dioxide Injection is a Patented Process and Proprietary technology of Sulfur Operations Support, Inc. The Sulview, Pressure Surge Relief Device, and Reflective Insulation, including the Snap-On technology, is Patent Pending and Proprietary Technology of Sulfur Operations Support, Inc.

More solutions to common sulfur recovery concerns

- **Multi-Point SO2 Injection** can **significantly increase** the Claus and Tail Gas Unit's capacity with minimal changes to existing equipment
  - SO2 is produced externally and injected into a thermal reactor or reaction vessel.



Sulfur Operations Support

Sulfur Operations Support Inc.

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Sulfur Operations Support

TWO STAGE SULFUR CLEAN UP TOWER

SUL-CLEAN

The purpose of the SIL-CLEAN tower is to remove/convert hydrogen sulfide compounds in the sulfur produced by claus recovery units.

The industry has used air for degassing for years in various forms and technologies under different names and designs. This configuration is the standard method with air for degassing.

However, the two primary differences follow:

production of the air bubbles utilizes a distribution system that increases the number of bubbles by decreasing the size which results in a large increase in the overall surface area.

Also, the tower uses a two-step method for contacting the air with the sulfur. The first stage removes the greater portion of H2S/H2Sx's, similar to existing designs. This contaminated air is removed from the tower. Then, a second contact section introduces fresh air to act as a polishing section for the sulfur which includes the same air diffusing system that is in the first stage of the tower.

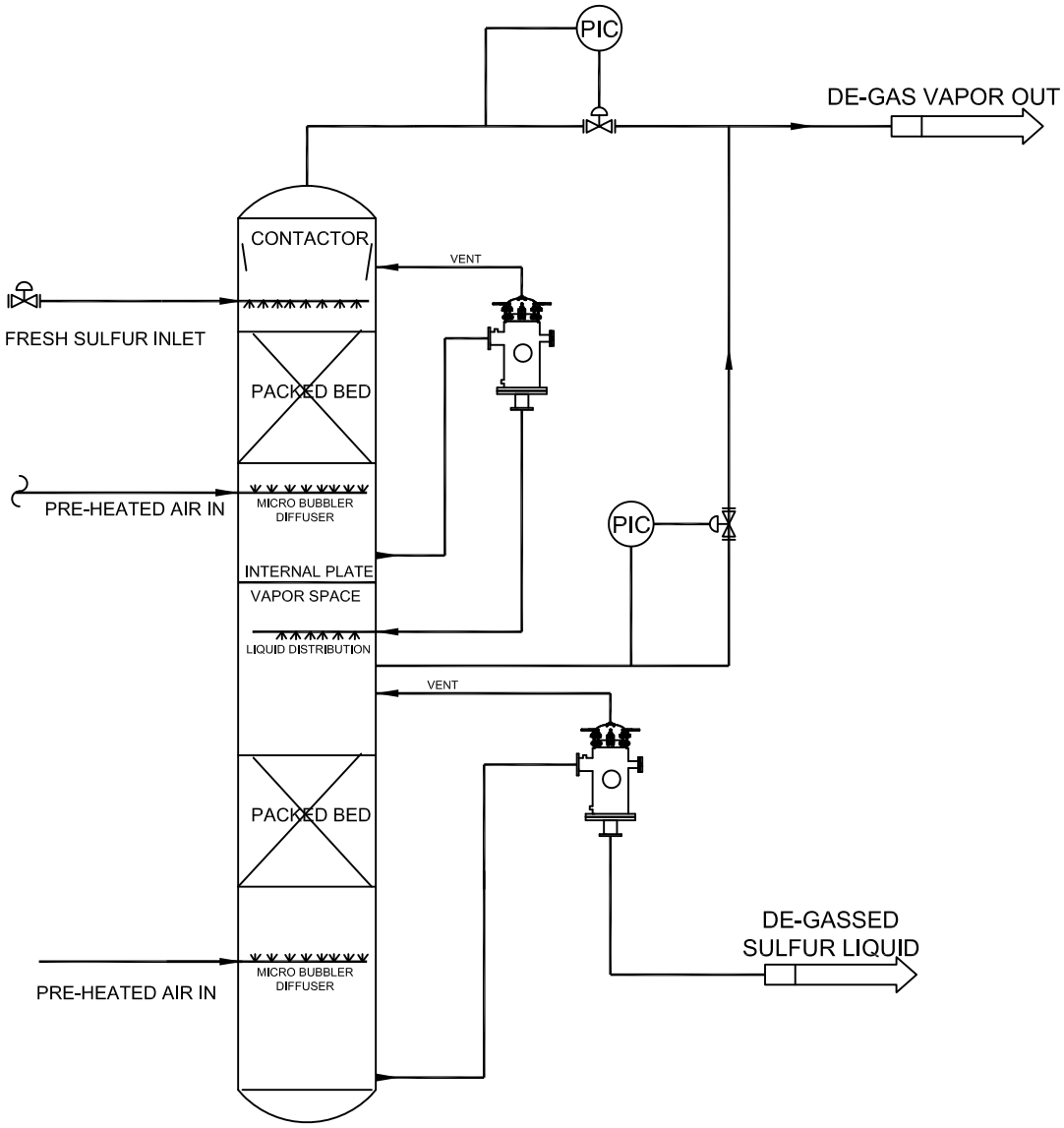
The sulfur flow/level is controlled by a SOS SulTrap designed for this special application. Standard level control devices have at time been an issue,

This two-step process provides that extra line of protection to prevent sulfur with higher than permitted levels of hydrogen sulfide from being transported.

For additional information, contact Sulfur Operation Support, Inc.

Strom Smith

President



NOTES:

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Sulfur Operations Support

SUL-CLEAN DEGASS TOWER

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Sulfur Operations Support

Sulfur Operation Support, Inc., is introducing the new SUL-Tower which incorporates a sulfur dioxide production tower with standard claus unit catalytic bed into a single vessel.

This revolutionary design will decrease plot space and overall cost of the standard claus train which utilizes several individual pieces of equipment into a single vessel.

The patent pending design uses a standard SO2 production whereby sulfur is produced in the bottom of the tower to make pure SO2 which can be used to injection into a standard design claus unit for capacity increase. SOS holds the patent on this technology for capacity increases in existing claus units.

This new configuration uses the same design for SO2 production whereby oxygen is introduced sub-liquid level of sulfur at prescribed temperature to combust/react the sulfur with oxygen (or air) to produce the high purity SO2.

In this design, the amine acid gas feed is introduced above the liquid level mixing with the high purity SO2. The combined feed gases start the claus reaction. The ratio is determined by the amount of acid gas and oxygen introduced into the tower.

The combined stream is cooled internally and flow upward through a riser. The reaction continues as the gas rises to the top of the tower. Once the flow reaches the tower head, the flow is reversed through a reheat phase and passes downward through the standard catalyst bed followed by a condensing section.

The sulfur is accumulated on tray and allowed to flow off the tray through SulTrap. The unreacted gases continue the downward flow through a capped pipe into the second reaction system which includes another reheat, catalyst bed and condenser. Again, the sulfur is collected and allowed to pass through a SulTrap in a pit or back into the liquid level of the tower.

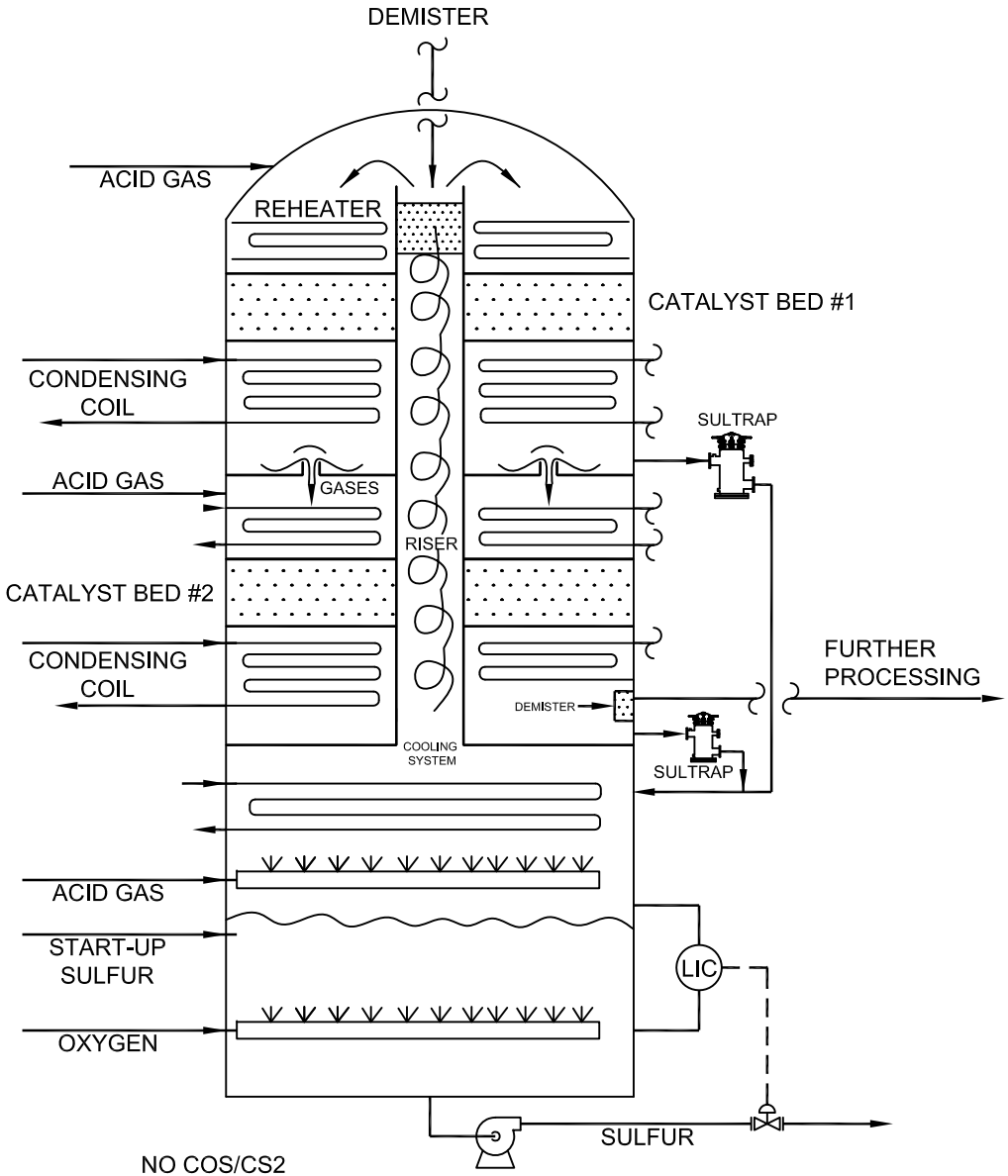
Both the above beds have slip stream of acid gas feed to adjust the ratio of the sulfur dioxide and hydrogen sulfide.

Calculated efficiency is approximately 95% or higher depending on the acid gas feed. Final efficiency is expected to be higher.

This system eliminates the thermal reactor along with all the issues of the refractory and elevated temperature experienced on the tube sheet of the WHB which is also eliminated.

The cooling phase and resulting riser acts at the first condenser prior to entering the first catalytic section. The final heat balance is determined by compositions of acid gas and resulting sulfur production. This determines how much of the produced and collected sulfur is directed back into the base of the tower.

Down stream processing of the tail gas can be minimized by adjusting the H_2S/SO_2 ratio in the last bed. This adjustment along with an additional bed can result in minimum or no hydrogenation reactor requirement.



PATENT PENDING

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Sulfur Operations Support

SULTOWER