

# Interactive Information Packet



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Sulfur Operations Support

Your source for Sulfur Recovery Solutions



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# Message from the President

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**Sulfur Operations Support, Inc.** is the industry's exclusive supplier of Sultrap™, an above ground sulfur sealing system. SOS, Inc. has over 25 years of experience in engineering, consulting, and equipment fabrication in the sulfur recovery industry. Since the initial development and installation of the first Sultrap, over 2000 units have been supplied for Claus units throughout the world.

**Our mission** is to continuously innovate the sulfur recovery industry with exceptional products and services that result in long-term, practical solutions.

We pride ourselves with producing high-quality and sustainable products. The focus of our equipment design and processes are simple, effective, and sustainable. This includes proprietary sight port systems, specialized lookbox designs with integral sampling, collection headers with integral Sultraps, cost-effective approach to replace jacketed piping systems and a multi-point Sulfur Dioxide injection system for capacity increase of Claus units. Our extensive knowledge and experience of the industry has enabled us to compile a performance history so we may offer on-site consultation, start-up training, inspection/analysis, and troubleshooting. All of our products are designed and fabricated per ASME, CRN, or PED (CE) standards. ISO 9001 to be completed soon.

Let us know about your Sulfur Recovery Unit and we will help you achieve a safer, more reliable, and environmentally-friendly working atmosphere.

Regards,



**Strom W. Smith**  
**President**  
**Sulfur Operations Support, Inc.**

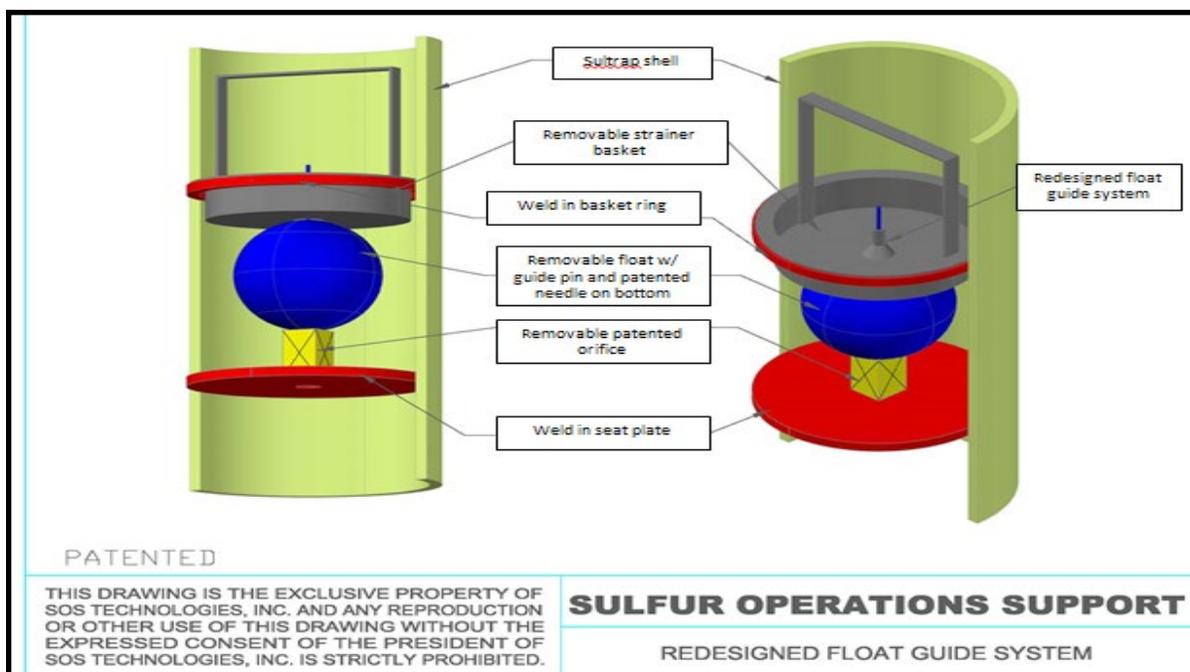
# Sultrap™

(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 only uses full 100% steam jacketing. 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.

**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 ingress. 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. With Sultrap, there are little to no piping changes, has a proven internal design, is highly cost-effective, and is entirely customizable per client's needs.

When placing an order for Sultrap, please specify one of the following material designations.

- 2001M - A All Carbon Steel with Internal (316L) Float Assembly
- 2001M - B Jacket and Shell (Carbon Steel), Head and Internals (316L)
- 2001M - C Jacket (Carbon), all Wetted parts including Flanges (S.S.)

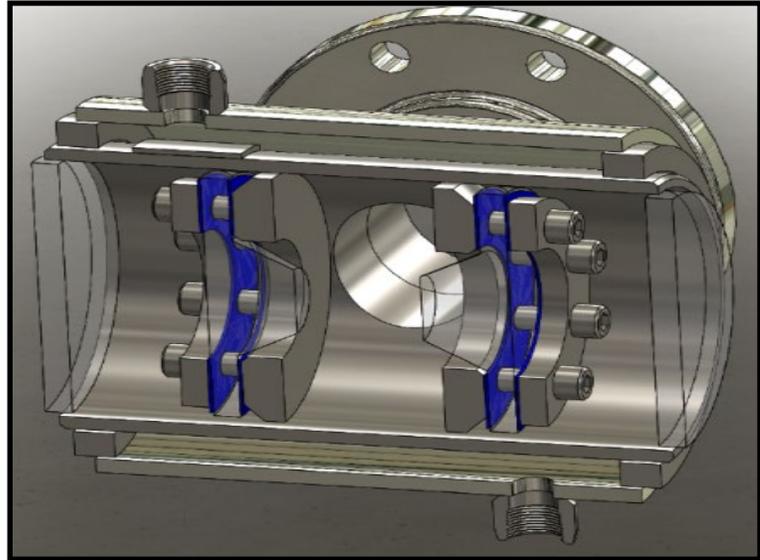
For a more detailed discussion on how we can tailor the right Sultrap for you, call us at 1-228-875-5515. We look forward to hearing from you and serving your needs.

# Sulview Sightport and Lookbox

(Sulview is Patent Pending and Proprietary 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 and comes in sizes of 4" by 6" or 3" by 4". Inner glass can be removed for inspection and maintenance.

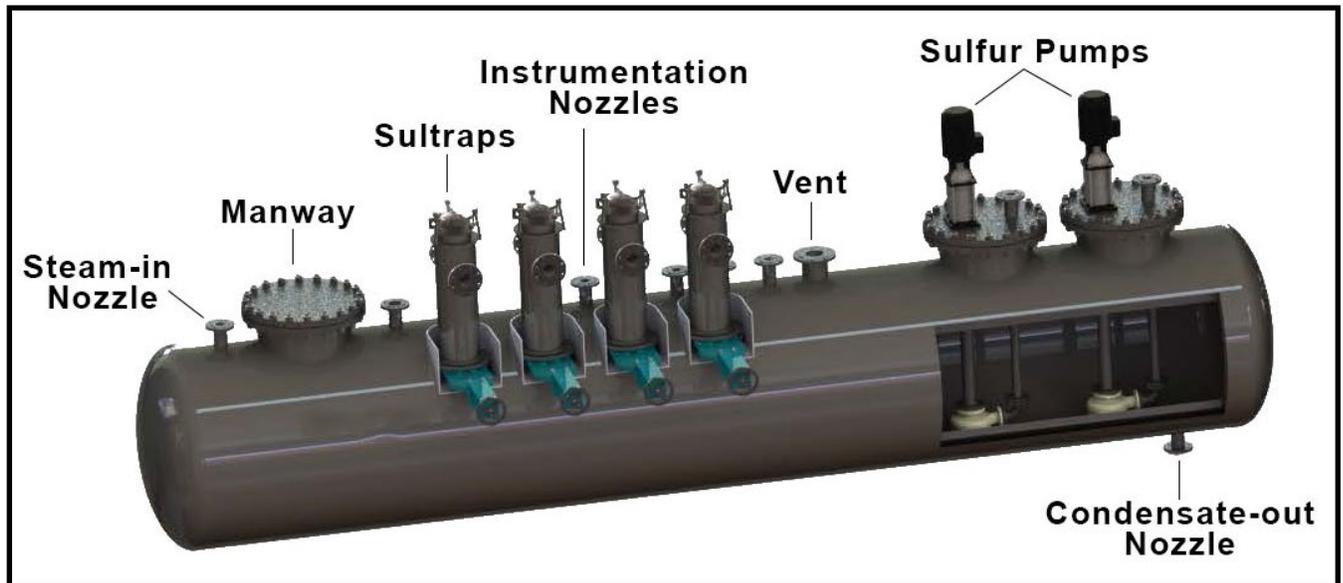
To further increase visibility, optional interior lights can be added.

Visual samples not enough? You can take physical samples with the Lookbox. We can modify or add a top access slide to your Sultrap™, Sulview sightport, or flange for physical inspection 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.



# 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 environmental 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 continuous online pump out for degassing (if required) to off-site storage. The SOS Collection Header can be provided with micro-bubble diffusers for degassing of the sulfur. Additional 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
- Fully enclosed; No escaping gases to activate H<sub>2</sub>S alarms, local corrosion, and operator complaints

# Pressure Surge Relief Device (PSRD)

(Patent Pending and Proprietary 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.

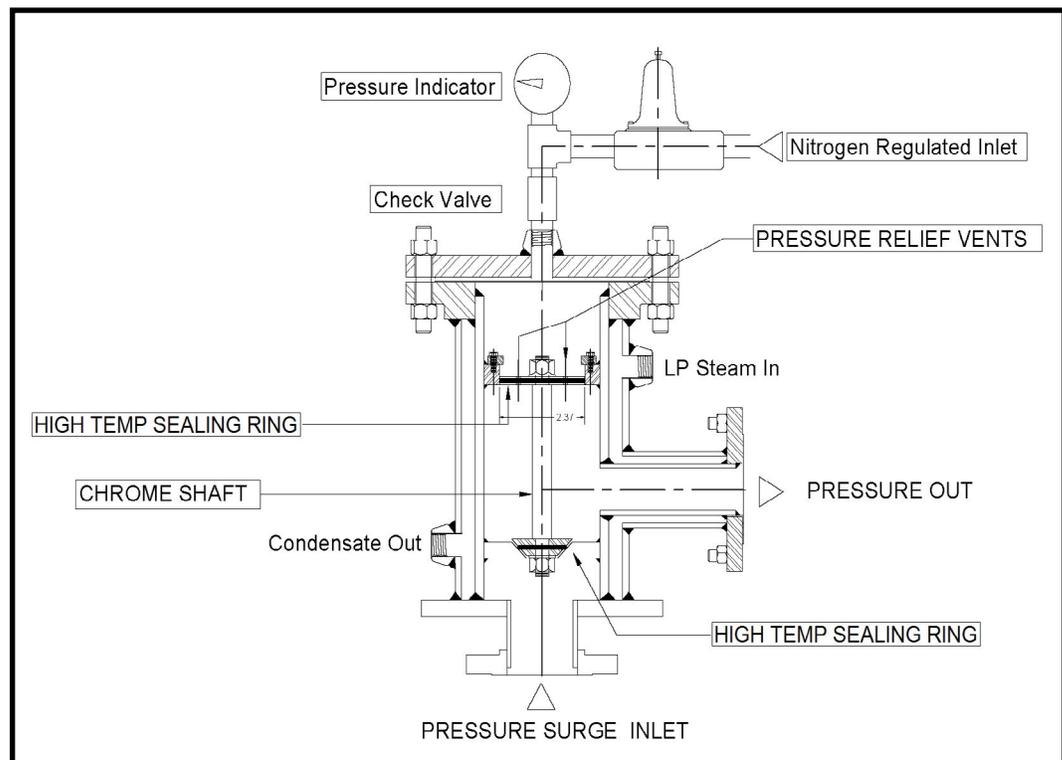
The top chamber has a nitrogen/instrument air (IA) pad and the gas pressure is supplied through a small instrument back pressure regulator. The set pressure is based on the overall cross section area between the top plate and the seat cross section area of the lower plug.

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



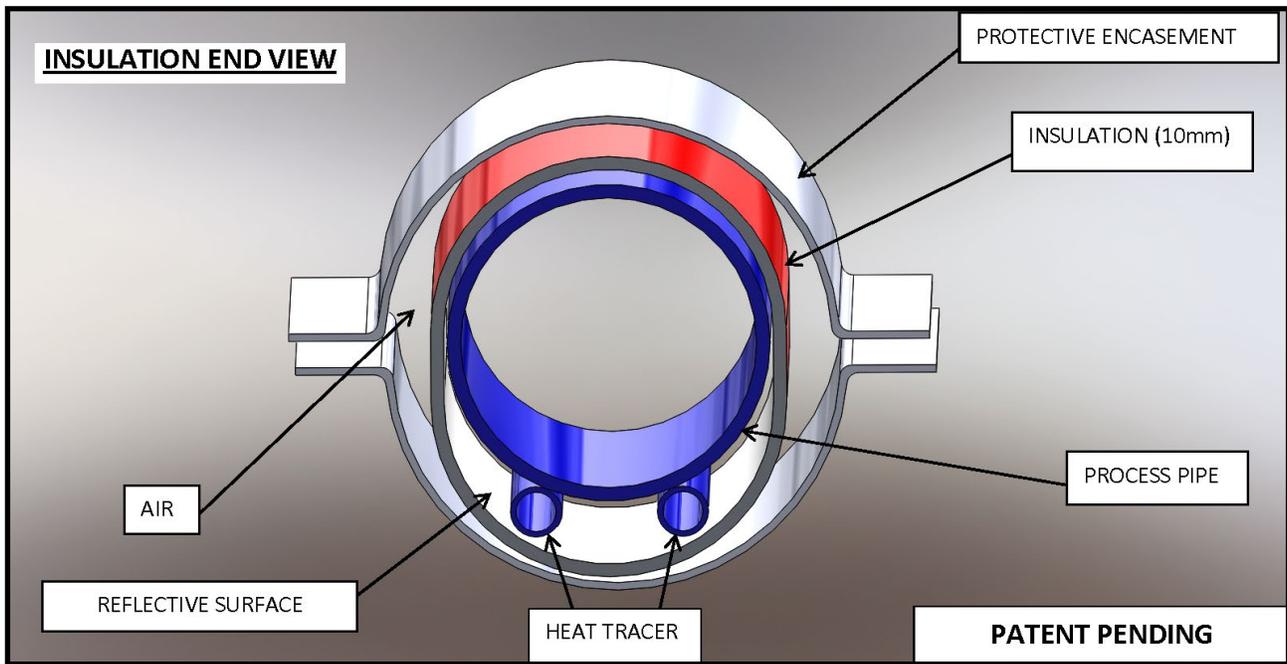
The upper plate has a maximum travel of 1 inch. In the upper chamber, the upper plate has small weep holes that allow a small volume of nitrogen/IA to continuously purge the relief chamber and exit out the pressure through the nozzle.

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.

# Reflective Insulation

(Patent Pending and Proprietary Technology of SOS, Inc.)



The Reflective Insulation is a new method of pipe heating, with a simple and effective design to resolve major issues in any process plant.

Full jacketed systems may be the overall best pipe heating system; however, there are disadvantages associated with this method such as:

- Higher cost per linear foot
- Longer time to fabricate
- Longer installation time

Should the inner core develop a leak, the resulting steam that leaks into the process system will create corrosion and blockage. Due to the design, it is virtually impossible to find the leak in the system.

The SOS Reflective Insulation System can result in significant time and cost savings over a full jacketing system:

- Lower cost per linear foot
- Most work can be done by anyone (easy to install standard steam traces)
- Shorter installation time and ease of use (SNAP-ON cover and the provided aluminum wrapping)

In conjunction with the SNAP-ON technology, insulating components can be easily removed and/or replaced without damaging the insulation. This means **no more** tearing off calcium-silicate, insulating materials. Just SNAP-ON!

**Subject:** Description and Test Results for the Reflective Insulation System

**Objective:** To Define and prove the capabilities of the new system in re-melting solidified sulfur.

**Assembly of Insulation System:**

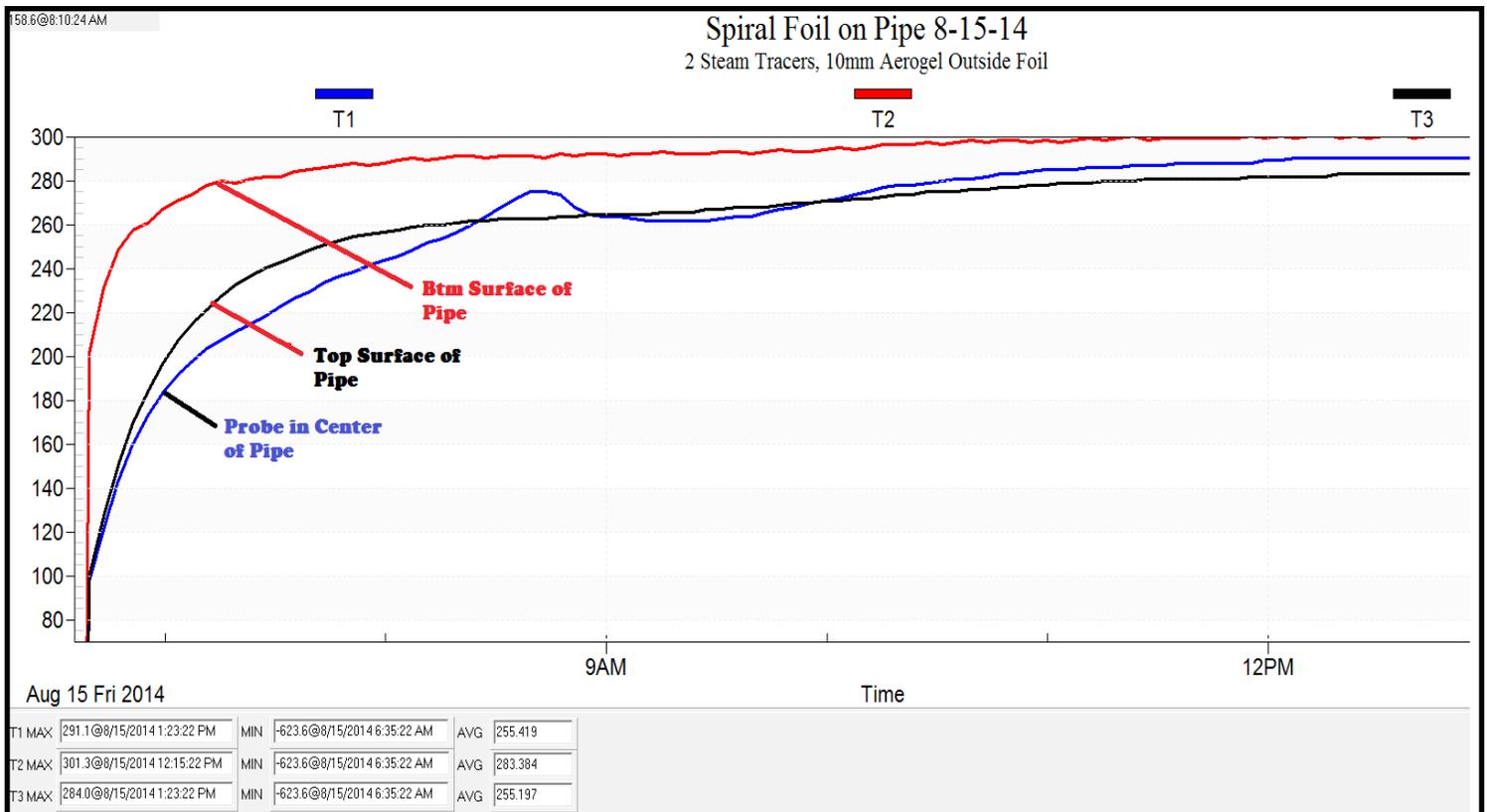
1. A reflective aluminum foil is wrapped around the 4" pipe with two or more 3/4" pipe steam tracers. The foil can be one wrap of standard household aluminum foil, the greater thicknesses or multiple wraps.
2. An aluminum shell surrounds the pipe, tracers, and foil - with a minimum 3/4" air gap.
3. The outside of the shell has insulation. The first layer of Aerogel is glued to the shell, and subsequent layers can be glued to the inside layer, depending on the conditions of the particular application.
4. A protective coating is applied to the outside of the insulation.

**Results:**

With room temperature (solid) sulfur in the pipe, the steam generator produced a flow of 60# steam thru 2 tracers. Surface thermocouples were mounted on the pipe, the outside of the aluminum foil, and on the outside of the shell (underneath the insulation). The foil was spirial wrapped and had approximately 6 layers. Ten mm of insulation was applied to the outside of the shell. The foil temperature rose to 200F in 5 minutes, and the temperature gain thereafter flattened out, reaching a max of 262F. The pipe temperature rose steadily - climbing to the melting point of sulfur of 248F in less than 60 minutes. The pipe temperature maxed out 278F. Liquid sulfur was exiting a hole at the midpoint of the pipe at 1.5 hours.

**Conclusion:**

With solid Sulfur melting at 1.5 hours after the steam tracers were activated, the test proves that this insulation method is very effective. It must also be noted that the energy savings 15-20% can be realized by using this method for insulating hot piping (no tracers) such as stea lines or other process piping.



# Sulfur Dioxide Injection

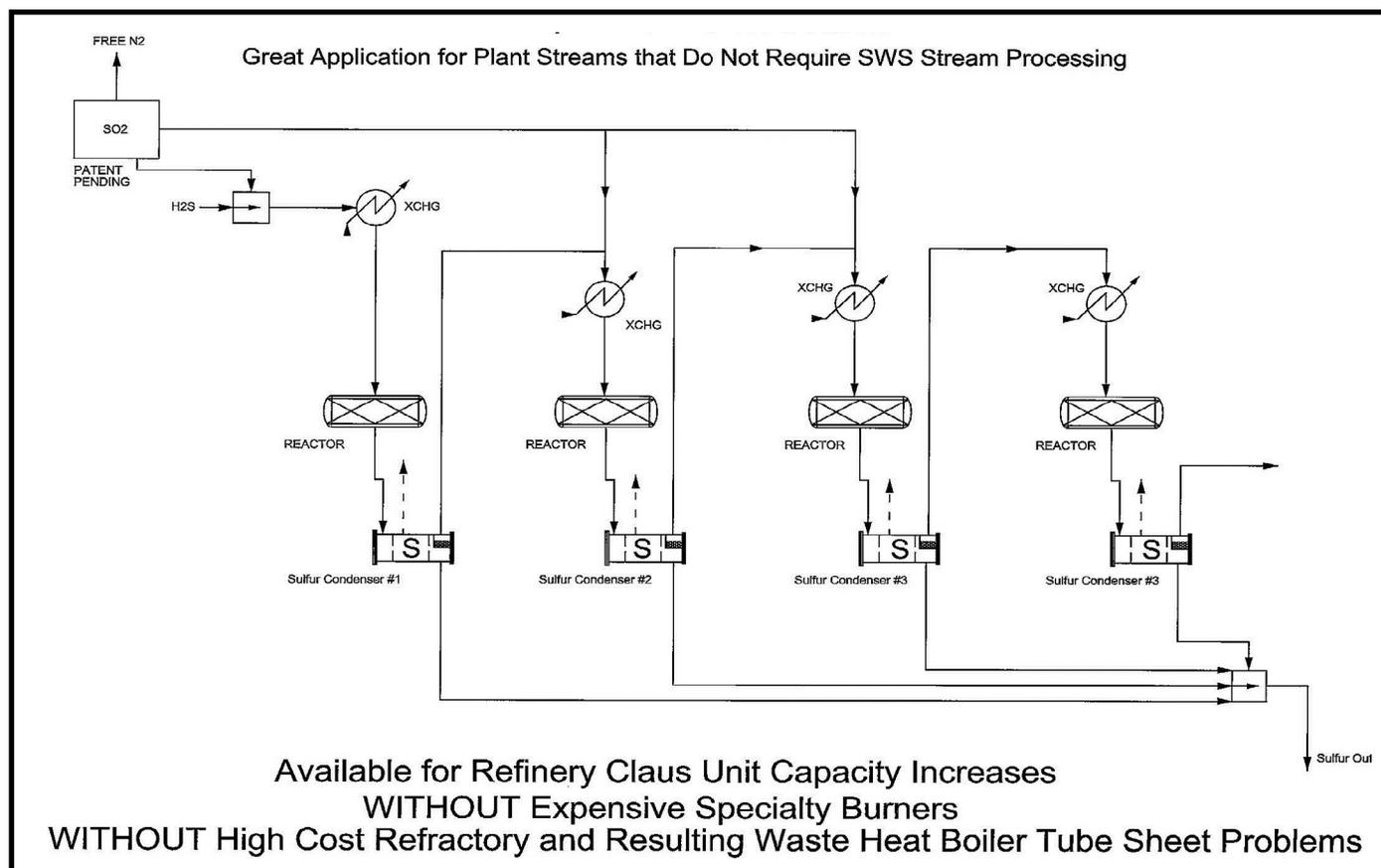
(Patented Process and Proprietary Technology of SOS, Inc.)

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 SO<sub>2</sub> is produced by a unique processing unit that also provides high quality 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 SO<sub>2</sub> injection in SRUs increases capacity with minimum modifications and provides flexibility for performance optimization
- SO<sub>2</sub> 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.

## CLIENT LIST IN ASIA

<b>Client</b>	<b>Location</b>
EXXONMOBIL	MALAYSIA
EXXONMOBIL	INDONESIA
GS CALTEX	SOUTH KOREA
HYUNDAI OILBANK	SOUTH KOREA
MALAYSIA REFINING	MALAYSIA
SHELL	MALAYSIA
SK CORPORATION	SOUTH KOREA
TECHTROPHY ENTERPRISE INC	TAIWAN
RELIANCE PETROLEUM LTD	INDIA
CHEVROIL	KAZAKHSTAN
POSCO	SOUTH KOREA
SINGAPORE REFINING COMPANY	MALAYSIA
JURONG AROMATICS	MALAYSIA
DAELIM INDUSTRIAL CO, LTD	SOUTH KOREA
mitsubishi kakoki kaisha, LTD	JAPAN
JGC VIETNAM	VIETNAM

## CLIENT LIST IN EUROPE

<b>Client</b>	<b>Location</b>
CHEVRON	WALES
GALP	PORTUGAL
KARPENSKAYA GAS	RUSSIA
LINDSEY OIL	UNITED KINGDOM
PETROGAL	PORTUGAL
ROMPETROL	ROMANIA
STAT OIL	NORWAY
TANECO REFINERY	RUSSIA
TECHNIP	FRANCE
TEKNOSTANDART	RUSSIA
TAIF-NK	RUSSIA

## CLIENT LIST IN MIDDLE EAST

<b>Client</b>	<b>Location</b>
ADNOC	UNITED ARAB EMIRATES
ARAMCO	SAUDI ARABIA
PETROCHEMICAL	KUWAIT
QATARGAS	QATAR
SAMREF	SAUDI ARABIA
WORLEY PARSONS	SAUDI ARABIA
PETROFAC	QATAR
TAKREER	UNITED ARAB EMIRATES
ADGAS	UNITED ARAB EMIRATES
SAIPEM	UNITED ARAB EMIRATES

## CLIENT LIST IN SOUTH AMERICA

<b>Client</b>	<b>Location</b>
ECOPETRO S.A.	COLOMBIA
PETROBRAS	BRAZIL
PETROZUATA JOSE REFINERY	VENEZUELA
REFINERIA DE CARTAGENA S.A.	COLOMBIA
SKANSKA	ARGENTINA
TECHNIP	BRAZIL

## CLIENT LIST IN CARRIBEAN

<b>Client</b>	<b>Location</b>
VALERO	ARUBA

## CLIENT LIST IN NORTH AMERICA

<b>Client</b>	<b>Location</b>
BP REFINING	UNITED STATES
CALUMET	UNITED STATES
CENEX REFINING (CHS)	UNITED STATES
CHEVRON	UNITED STATES
CONOCOPHILLIPS	UNITED STATES
ELK HORN REFINERY	UNITED STATES
EXXONMOBIL	UNITED STATES
LYONDELL BASSELL	UNITED STATES
MARATHON OIL	UNITED STATES
MOTIVA	UNITED STATES
PHILADELPHIA ENERGY SOLUTIONS	UNITED STATES
PREMCOR	UNITED STATES
REGENCY GAS	UNITED STATES
SUNOCO	UNITED STATES
TESORO REFINERY	UNITED STATES
PRINCIPAL TECHNOLOGY (PTI)	UNITED STATES
FLINT HILLS RESOURCES (FHR)	UNITED STATES
TESSENDERLO KERLY (TKS)	UNITED STATES
DUKE ENERGY	UNITED STATES
VALERO	UNITED STATES
SUNCOR ENERGY	CANADA
CANADIAN NATURAL (CNRL)	CANADA
NEXEN	CANADA
IMPERIAL OIL	CANADA
CHEMTRADE	CANADA
CHEVRON	CANADA
ENCANA	CANADA
SPECTRA ENERGY	CANADA