Topsoe WSA
converting H$_2$S to sulphuric acid offshore

Unlock Your
Offshore Sour Gas
With Topsoe WSA Technology

◦ Flexible ◦ Simple ◦ Proven Process
Unlocking Stranded Sour Gas Fields

The lack of a practical offshore treatment process to manage \( \text{H}_2\text{S} \) has left sour oil and gas reserves stranded where they are, too far from shore to make onshore treatment economic. Offshore re-injection of acid gas suits only a select few geological formations and requires sophisticated compression systems hence, sour fields have been passed over as uneconomic.

DRL Engineering are experts in optimizing the overall process selection for offshore developments and have found Topsoe WSA technology to be well suited for high volume \( \text{H}_2\text{S} \) gas processing offshore. Applying the Topsoe WSA technology offers a real opportunity to produce stranded sour gas fields.

Preferred Technology Criteria

An ideal solution for offshore sulphur management would be:
- Environmentally compliant worldwide
- Proven technology; Simple, Reliable, Low Maintenance
- Mature sulphur product handling practices & supply chain
- Flexible to feed stock composition
- Conventional metallurgy
- Safe to operate in an offshore environment
- Compact footprint

The Topsoe WSA process can meet these criteria.

Wet gas Sulphuric Acid Technology

Developed from mature sulphuric acid manufacturing technology but with \( \text{H}_2\text{O} \) tolerant catalysts specifically for use on wet gas, as produced from \( \text{H}_2\text{S} \) combustion. The Topsoe WSA process converts the products of acid gas combustion into sulphuric acid and clean stack gas.

Sulphuric Acid Storage

- carbon steel tank material for concentrated sulphuric acid
- no blanket gas required
- ambient storage conditions
- no special containment requirements

Offloading

- liquid sulphuric acid transported by ship since 1931, now the world’s largest volume chemical commodity
- routine handling procedures well established and regulated
- worldwide fleet of chemical tankers widely available for range of parcel sizes

Sulphuric Acid Market

- saleable commodity, the Topsoe WSA process produces industrial grade concentrated sulphuric acid
- worldwide market, 15 million tonnes per annum exported
- Southeast Asia a net importer of sulphur acid

The Topsoe WSA process can be paired with amine, membrane or hybrid gas sweetening units – DRL Engineering are experts in optimising the overall process selection.
**Topsoe WSA - a net power producer**

The Topsoe WSA process plant is a net producer of power in the form of steam. Assist gas may be required for acid gas combustion however, even this heat energy may be recovered. Steam generated can be used in other parts of the process facilities (typically amine and glycol reboilers, condensate stabilisation) and the excess steam used for power generation. DRL has the know-how to maximise the benefits of the produced energy.

**Offshore Implementation**

The Topsoe WSA plant design is well suited to offshore modularisation builds. A typical onshore layout already has a compact footprint which can be further improved upon. The only equipment items that do not have an offshore track record are the reactor and condenser – both are well understood, robust and tolerant to motion on floating facilities. The process lines use carbon steel piping, no exotic CRA or stainless steel materials are required. Limited use of rubber lined piping is necessary in high temperature sections and a refractory lining is used in the sulphuric acid condenser; all supplied and guaranteed by Haldor Topsoe.

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**Topsoe WSA Plant Operation**

- simple plant operation
- control room monitoring
- turn down typically 40%, lower if required
- high plant availability; 99% up time over a 10 year period has been experienced
- uses well proven, reliable thermal oxidizer technology

**Topsoe WSA Plant Safety**

- no high pressure H₂S gas sources (e.g. as found in compression for reinjection)
- no solid or molten sulphur handling
- no sulphur particulates or dust from solid sulphur
- sulphuric acid handling procedures and regulations well established
- experienced operators and training widely available

**Topsoe WSA Plant Maintenance**

- typically 2 year period between shut down inspections (1 week duration)
- combustor refractory, condenser refractory and piping inspection, no major maintenance items
- catalyst change out every 8-10 years

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**FPSO Layout**

DRL produce facility specific optimised layouts for each application

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*Layout illustration relative to typical chemical carrier*
✓ Environmentally compliant
✓ Proven technology – simple Operation & Maintenance
✓ Mature sulphuric acid product handling practices & supply chain
✓ Flexible to feed stock composition
✓ Conventional metallurgy
✓ Safe to operate offshore
✓ Compact footprint