UNCONVENTIONAL SRU CAPACITY DEBOTTLENECKING VIA ATS PRODUCTION

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BASIC INFORMATION ON EXISTING SRU

- **Units (Year of Commissioning):** SRU 100 (2000), SRU 200 (1998)
- **Licensor:** Jacobs’ Comprimo® Sulfur Solutions (NL)
- **Contractor:** Jacobs’ Comprimo® Sulfur Solutions (NL)
- **Process:** SuperClau®
- **Design Capacity:** 2x 135 t/day
- **Max. Capacity:** 2x 142 t/day
- **Max. S Content in Crude Oil:** 1.76 % wt.
- **Sulphur Recovery Efficiency:** min. 99 % (≈ 99.3 %)
LOCATING BOTTLENECK

Sulphur Production, kt/year

Design Capacity: 2x 45 kt/year !!!

SRU 200
SRU 100
Seaborne Crude Oil Test Run
IDENTIFYING ROOT CAUSE

Max. Sulphur Content in Crude Oil:
1,76 % wt. !!!

REB Sulphur Content, % wt.
HOW TO INCREASE ACID GASES PROCESSING CAPACITY?

Expand SRU Capacity:
- O₂ Enrichment;
- Revamp of Existing SRU;
- New SRU;

Other options:
- Two-Stage SWS
- Two-Stage SWS + SCO
- SWAATS®

Sulphur: Co-Product or By-Product?
SULPHUR MARKET OUTLOOK
SULPHUR MARKET OUTLOOK

- Unconventional SRU capacity debottlenecking via ATS production

- Graph showing sulphur supply by region from 2011 to 2015

- Map illustrating global sulphur trade flows with key regions highlighted
HOW TO INCREASE ACID GASES PROCESSING CAPACITY?

Expand SRU Capacity:
- O₂ Enrichment
- Revamp of Existing SRU
- New SRU

Other options:
- Two-Stage SWS;
- Two-Stage SWS + SCO $4\text{NH}_3 + 3\text{O}_2 \leftrightarrow 2\text{N}_2 + 6\text{H}_2\text{O}$;
- SWAATS® $6\text{NH}_3 + 4\text{SO}_2 + 2\text{H}_2\text{S} + \text{H}_2\text{O} \leftrightarrow 3(\text{NH}_4)\text{S}_2\text{O}_3$. 
AMMONIUM THIOSULPHATE

Applications:
- (Rapid Photographic Fixer);
- Catalyst in Precious Metals Leaching;
- Fertilizer;
- Additive to Coal-Waste Mixtures (?);

Typical Product Properties:
- State: Aqueous Solution, 52,0 – 62,0 Wt%;
- N content: 11,5 – 12,5 Wt%;
- S content: 25,5 – 26,5 Wt%;
- pH: 6,5 – 8,0.
SWAATS® – SRU RELATION

- RHC, VGH, FCC
- HCK
- GHT
- SWS
- SRU
- AAR, GDS
- SWAATS
- NH₃
- ATS
- SWSG
- S
SWAATS® – PROCESS DIAGRAM

Ammonium Bisulfite (ABS): \((\text{NH}_4)_2\text{HSO}_3\)
D-Ammonium Sulfite (DAS): \((\text{NH}_4)_2\text{SO}_3\)
Ammonium Thiosulfate (ATS): \((\text{NH}_4)_2\text{S}_2\text{O}_3\)
SWAATS® & ECONOMICS

1. Frees Capacity on SRU for 141 t/day of H₂S;

2. Reduced Operating Costs & Better Process Control in SRU;
   • MP Steam from SWAATS;
   • Longer Catalyst Life;

3. Lower CAPEX than Claus and Amine-Base Tail Gas Treatment of SWSG;

4. Negative Operating Costs;
   • Electricity Consumption vs MP Steam Production;

5. Increased Value of S in Form of ATS;

6. No Increase in Operator Count.
NEW SRU CAPABILITIES

- **Capacity:**
  - Design: 2x 135 t/day
  - Forecast: 2x 165

- **Max. S Content in Crude Oil:**
  - Design: 1,76 % wt.
  - Forecast: 2,27 % wt.

- **Sulphur Recovery Efficiency:**
  - Design: min. 99 % (≈ 99,3 %)
  - Forecast: ≈ 99,5 %

Thermal Stage: \( \text{H}_2\text{S} + 1,5\text{O}_2 \leftrightarrow \text{SO}_2 + \text{H}_2\text{O} \);
Claus Reaction: \( 2\text{H}_2\text{S} + \text{SO}_2 \leftrightarrow 3/8\text{S}_8 + 2\text{H}_2\text{O} \);
Overall Reaction: \( \text{1H}_2\text{S} + 0,5\text{O}_2 \leftrightarrow 1/8\text{S}_8 + \text{H}_2\text{O} \);

NH\text{3} Combustion: \( \text{1NH}_3 + 1,5\text{O}_2 \leftrightarrow 0,5\text{N}_2 + 1,5\text{H}_2\text{O} \).
SWAATS® & OPERATION

1. Improved Control over H₂S/SO₂ Ratio in SRU;
2. Low Demand for Operator Attention;
3. Able to Recover from Upsets;
   • Dissolving Elemental S → S + SO₃²⁻ ↔ S₂O₃²⁻.
SWAATS® & ENVIRONMENT

1. **Reduced SO2 Emmisions;**
   - Multistage Liquid Scrubbing of Vent Gas (SRE: 99,75 %);
   - Improved S Conversion and Recovery in SRU (SRE: 99,5 %);

2. **Reduced CO2 Emmisions;**
   - MP Steam from SWAATS;
   - No Fuel Consumption;
   - No Need for NH₃ Synthesis;

3. **Reduced requirements for N Fertilizers and loss of (NO₃)⁻ to ground water;**
   - Improved Crop Utilization of Fertilizer N.
SWAATS® & HEALTH & SAFETY

1. ATS Has Low Toxicity and Is Stored at Atmospheric Pressure and
   Moderately

2. Chemistry Minimizes Risk of H₂S Escape Resulting from Liquid Leakage.
SWAATS® NOW UNDER CONSTRUCTION
THANK YOU FOR YOUR ATTENTION
IF YOU HAVE ANY QUERIES, PLEASE, FEEL FREE TO ASK..
OR CONTACT US:

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