

Family of Patented Processes

HIGHSULF™

Selective Removal of H₂S
Acid Gas Enrichment
Tail Gas Treatment

TKK COMPANY

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*“The beauty of HIGHSULF™ process in its simplicity”
- Dr. Tofik K. Khanmamedov, Inventor*

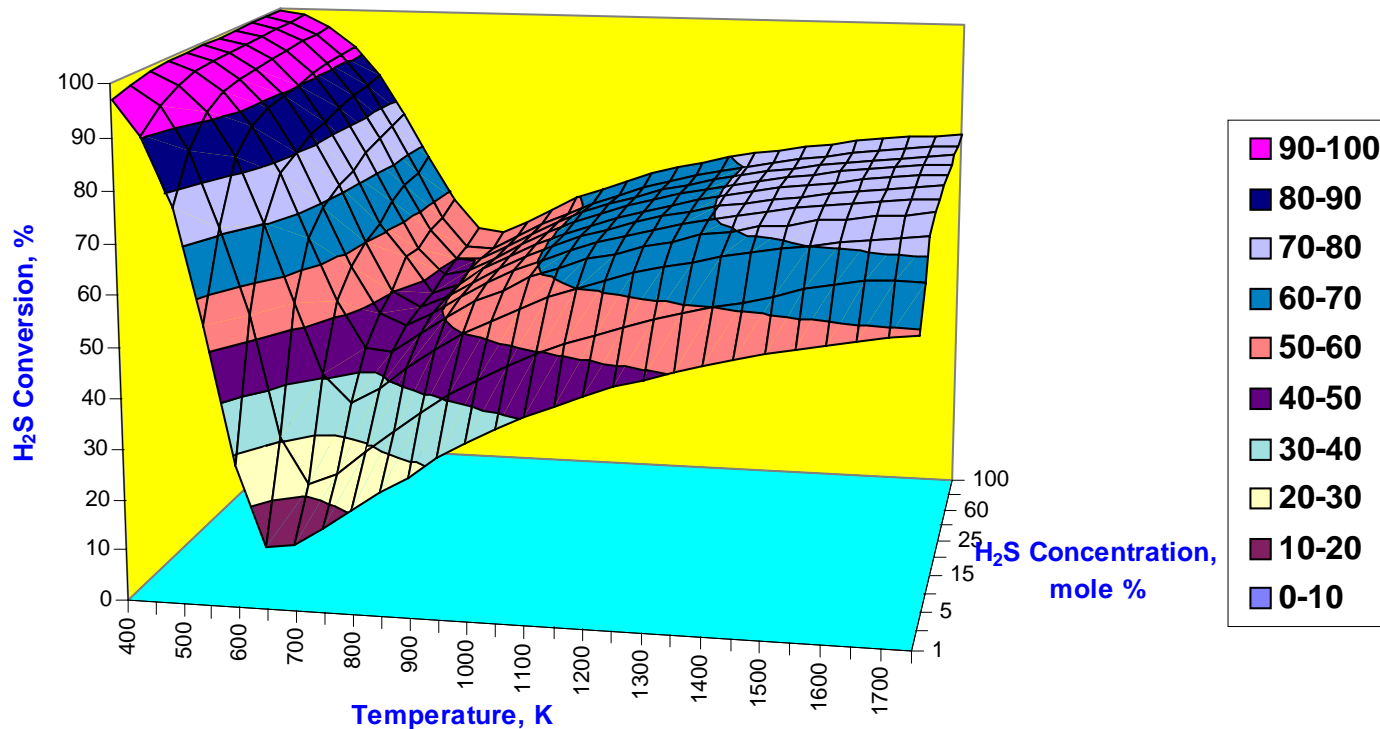
Family of Patented HIGHSULF™ Processes

**Acid Gas Enrichment at
Zero Operating Cost and
Next to Zero Capital Investment**



TKK TECHNOLOGY COMPANY LLC (dba TKK COMPANY) – unique technology engineering company incorporated in Houston, Texas, USA. In alliance with engineering-construction companies we design, fabricate and supply units for amine desulfurization, sulfur recovery, tail gas treatment and other processes globally.

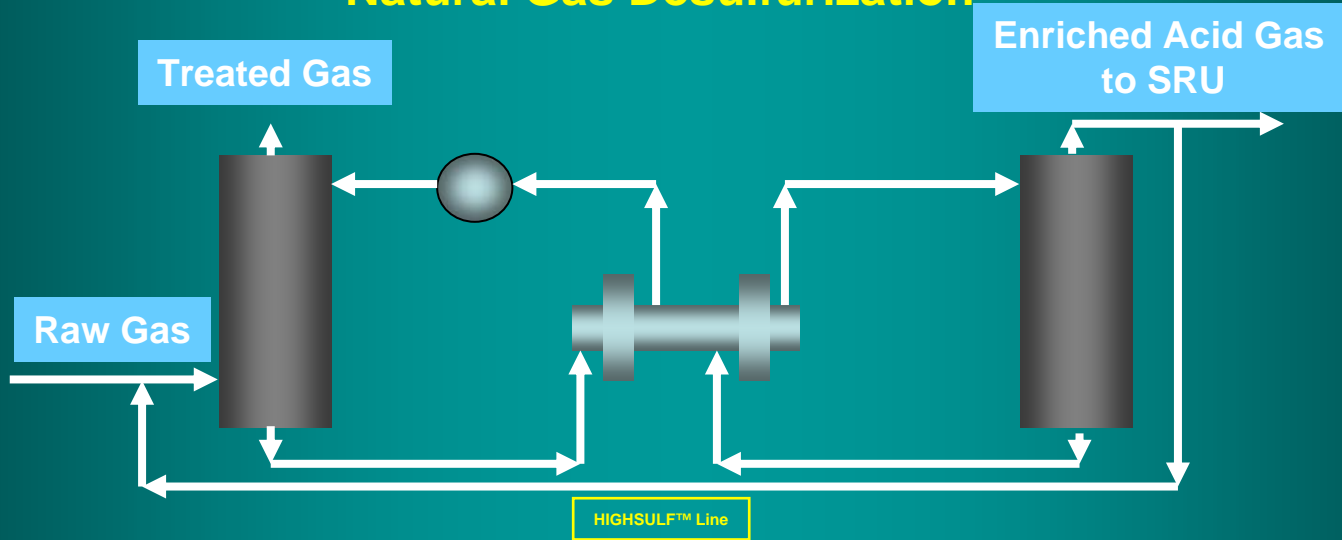
EQUILIBRIUM CONVERSION OF HYDROGEN SULFIDE TO SULFUR VS. TEMPERATURE VS. CONCENTRATION



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For the first time in sulfur world Dr. Tofik K. Khanmamedov expressed unique and complicated thermodynamic of Claus sulfur recovery process in 3d format.

Patented **HIGHSULF™** Process - Natural Gas Desulfurization

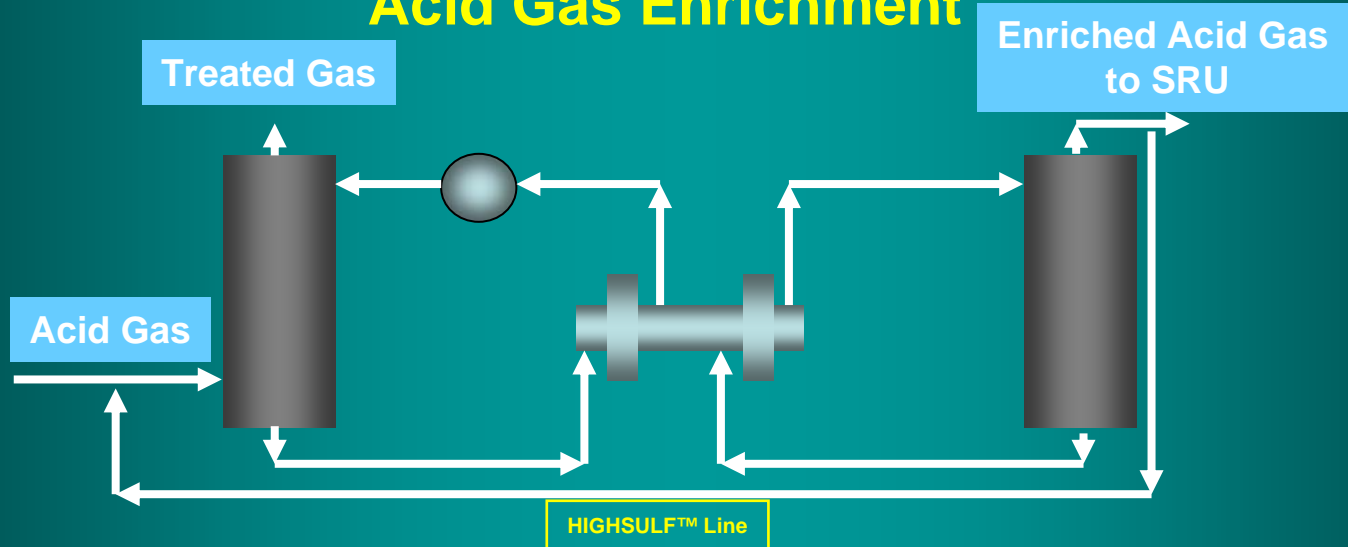


Components	Acid gas composition, mole %	
	Regular MDEA based amine unit	HIGHSULF™ MDEA based amine unit
H ₂ S	35.10	66.20
CO ₂	55.30	27.20
H ₂ O	8.43	6.40
Hydrocarbons	1.17	0.20

Advantages of HIGHSULF™ process in compare with regular:

- Substantial increases H₂S concentration in the acid gas
- Reduces the size of a new SRU or increases the capacity of an existing one
- Substantially reduces the level of hydrocarbons in the acid gas and leads to an increased life for catalyst in the first reactor of SRU

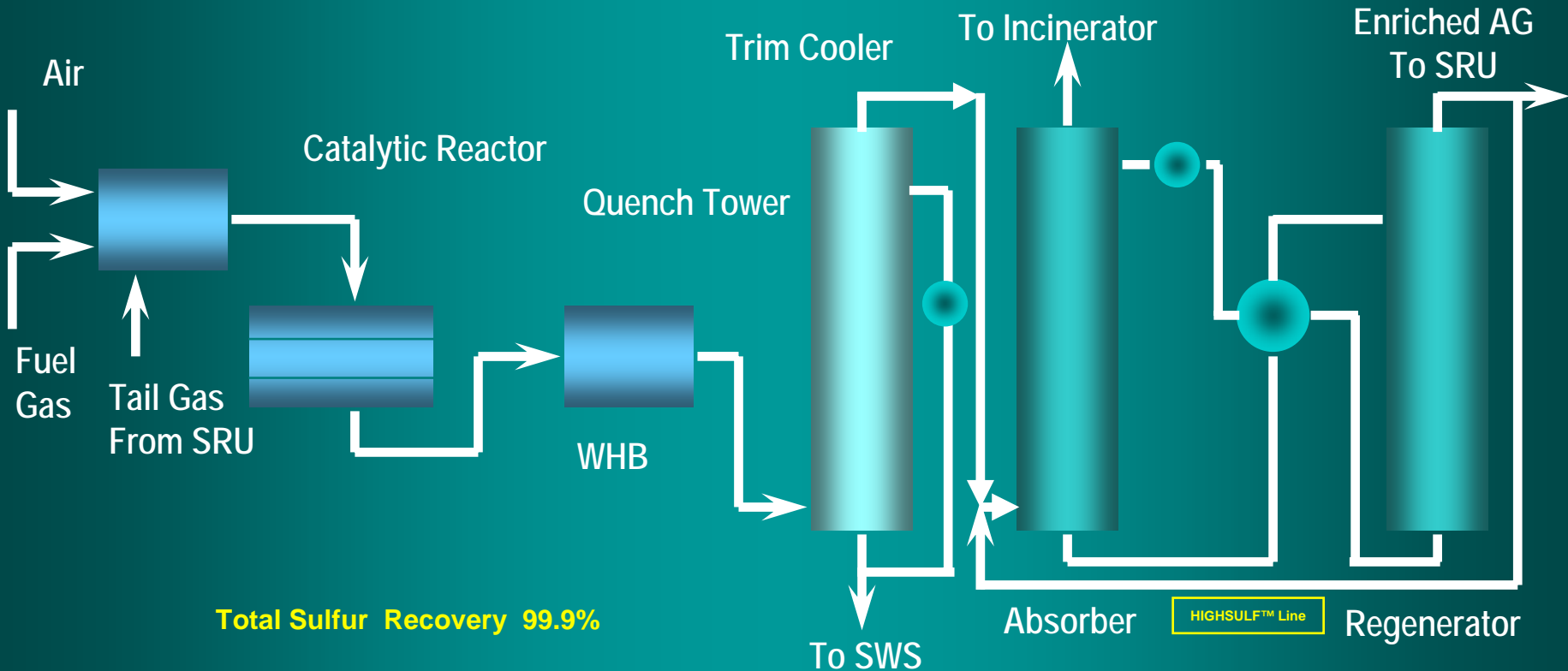
Patented HIGHSULF Plus™ Process - Acid Gas Enrichment



Parameters	Performances of Regular and HIGHSULF Plus™ Acid Gas Enrichment Units, MDEA	
	Regular	HIGHSULF Plus™
H ₂ S in SRU feed (% mol)	62	80
Mass flow to SRU (Lb/hr)	3223	2438
H ₂ S to incineration (ppm)	100	48

Hydrocarbon Engineering, Dec, 2003; Khimia i Teknologija Topliv i Masel, 6, 2003 (Russia); Sulphur, Sept-Oct, 2008; Sulphur, Sept-Oct, 2010; Laurence Reid Gas Conditioning Conference, Norman, OK, 2008; PTQ Gas, spring, 2008; Hydrocarbon Engineering, Dec 2010; 7th International Conference SOGAT (Abu Dhabi, UAE) 2011; Sulphur 2011, Houston, Texas; Hydrocarbon Engineering, July, 2012; Hydrocarbon Engineering, August, 2012; Sulphur, Sept-Oct, 2012.

Patented HIGHSULF™ Process - Tail Gas Treatment



Total Sulfur Recovery 99.9%

Advantages of HIGHSULF™ TGTU in compare with regular TGTU:

- More effectively utilize generic MDEA.
- Substantially enriches acid gas with hydrogen sulfide.
- Substantially reduces acid gas flow rate and increases capacity of SRU.
- Reduces operating cost of water coolers and eradicates trim cooler problems.
- Requires zero operating cost and next to zero capital investment.

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Patented HIGHSULF™ Process - Tail Gas Treatment

Total Sulfur Recovery – 99.9%

Parameters	Relative extent of HIGHSULF™ application in regular Tail Gas Treatment Unit, MDEA*					
	0 (Regular)	1	2	3	4	5
H₂S to SRU (% mol)	38.6	41.8	46.4	53.6	66.3	71.4
H₂S to Incinerator (ppmv)	5.3	6.4	7.3	9.3	16.6	40.2
CO₂ Slip (%)	58.8	64.2	70.8	78.7	88.5	91.4

* Generic Methyldiethanolamine

Hydrocarbon Engineering, Dec, 2003; Khimia i Teknologija Topliv i Masel, 6, 2003 (Russia); Sulphur, Sept-Oct, 2008; Sulphur, Sept-Oct, 2010; Laurence Reid Gas Conditioning Conference, Norman, OK, 2008; PTO Gas, spring, 2008; Hydrocarbon Engineering, Dec 2010; 7th International Conference SOGAT (Abu Dhabi, UAE) 2011; Sulphur 2011, Houston, Texas; Hydrocarbon Engineering, July, 2012; Hydrocarbon Engineering, August, 2012; Sulphur, Sept-Oct, 2012.

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