D-Foam INCORPORATED

Partial Customer List – SigmaPure

- Shell Oil Products US (Chemical, Refining)
- Shell Canada Ltd (Natural Gas Processing)
- ExxonMobil (Gas Processing, Refining)
- RasGas (LNG)
- Nigeria LNG (LNG)
- NatcoGroup (Natural Gas Processing)
- Kinder Morgan (Natural Gas Processing)
- Kerr McGee (Natural Gas Processing)
- Husky Energy Ltd. (Natural Gas Processing)

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SigmaPure Partial Reference List

Company	Plant Location	Process Description	Solvent	Volume Treated [US gal]	Comments
		Coal Seam Gas Plants	MDEA	unknown	not disclosed
		Olefin Feed Gas Plants	MDEA	90,000	Suspended solids were reduced to 1 ppm. Foaming tendency and break time were reduced to almost "0". They were able to double the amine concentration for the first time. The plant increased its absorber throughput by 15%. They reported no foaming upsets in over 6 months post treatment.
		Central Amine	DIPA	60,000	Solvent was on spec, but plant experience suggested an upset was imminent. The SigmaPure System concentrated surfactants present to approximately 7 US gallons. The plant upset 30 hours after treatment. Foamate analysis showed the contaminant to be associated with liquid hydrocarbon. This confirmed plant suspicions. That particular hydrocarbon has been avoided, and the plant has not seen an upset in over 4 months.
		Tail Gas	DIPA	85,000	The need to inject antifoam due to tower differential pressure was reduced within a day of SigmaPure initiation, from 1X per shift to less than 1X/week. Clarity was improved dramatically. The contaminants have been identified. The results are currently being reviewed by plant personnel.
		Mixed Fuel Gas	DEA	26,500	This system was notorious for upsets. Two different antifoam chemistries were being used to control foaming. It was suspected that excess antifoam was present with other surfactants. This has been confirmed, with the other dissolved surfactant contaminants currently being identified.
		Mixed Fuel Gas	DEA	25,000	This plant had foaming upsets frequently and without warning. Operators mentioned an improvement in absorber performance during SigmaPure run. Clarity and color were also improved.
		Coker/PSA	DEA	1000000 +	Foaming upsets occurred every 4 days on average. Plant was highly contaminated with extremely fine solids and liquid hydrocarbon. Three foaming upsets were reported in 4+ months of operation after the SigmaPure System was installed. A total of 150 gallons of waste was generated.
		Natural Gas	Sulfinol-D	500000 +	Antifoam was being added on a continuous basis prior to SigmaPure being installed on plant 2. AFA usage was reduced to intermittant. Filter changeouts were reduced by 4X. Plant responded nicely, but showed signs of upset only minutes after the unit was removed. Plant was able to increase gas throughput without continuous antifoam for the first time in years. The unit was transferred to plant 1. The plant failed to resond after two weeks of treatment. Mechanical damage was suspected and confirmed. Plugged downcomers in the absorber.
		LNG	DEA	1000000 +	The plant reported seeing approximately 4 dp spikes per day. They suspected liquid hydrocarbon, but none had ever been seen in the inlet separator. The first commercial grade unit was fabricated and installed. The initial solvent data looked very good. Hydrocarbon was detected on inlet and foamate, but none in treated discharge. The plant failed to respond. Mechanical damage was the diagnosis.
		Natural Gas	DEA	25,000	The unit was installed for 1 week. They had been unable to increase plant throughput past a specific point without massive amounts of antifoam. Foamate accumulation was slow, and the plant failed to respond. Mechanical damage was suspected and confirmed. Tower bottom piping was designed incorrectly. The piping arrgement was corrected and the plant was able to run at design rates.
		Natural Gas	MDEA	60,000	The unit was installed for 4 weeks. Foamate accumulation was slow but steady. Foaming tests showed little to no foaming tendency. Mechanical damage was suspected. Design review of the tower internals showed undersized downcomers. Chemical analysis showed some known surfactants, so residual cleaning chemicals were also suspected.
		Natural Gas	Sulfinol-D	unknown	The first commercial service unit was installed on plant 2. The plant resonded nicely with antifoam only being added intermittantly. Foamate accumulation showed the inventory improving to "like new" surface tension and foaming tendency. Developed "prequalification" testing protocol to predict mechanical damage vs chemical foaming causes.
		Natural Gas	MDEA	60,000	The unit was installed to address suspected foaming problems, and reduce filter changeout costs by solids removal. The solvent was found to be heavily contaminated with iron sulfide - liquid hydrocarbon agglomerates. Foamate accumulation and plant response were excellent. Antifoam injection was reduced from constant to intermittant. Filter changeouts were unaffected due to small amounts of solids remaining in the solution. They resisted flotation due to hydrocarbon in the agglomerates. Filters were changed from surface to depth type. The solvent continued to be contaminated despite installing a new inlet gas coalescer. The problem was found to be small ingess from a reflux to stripper surfactant concentration loop. Increase in stripper overhead temperature eliminated the reflux loop, and the plant cleaned up nicely. However, contaminants normally collected in the reflux were consequenly sent down stream to another unit.
		Flexicoker Gas Plant	FLEXSORB SE	1000000+	Solution was foaming badly preventing the plant from operating at design condition. Previous foaming upsets resulted in environmental exceedences. Approximately 1 quart of antifoam was being added to the system every 4 hours for over a month prior to treatment. Approximately 400 gallons of foamate was collected from the 80,000 gallon inventory. The plant was able to run at design without foaming or antifoam addition. No foaming upsets in over 18 months after treatment. No signifcant antifoam added since treating.