

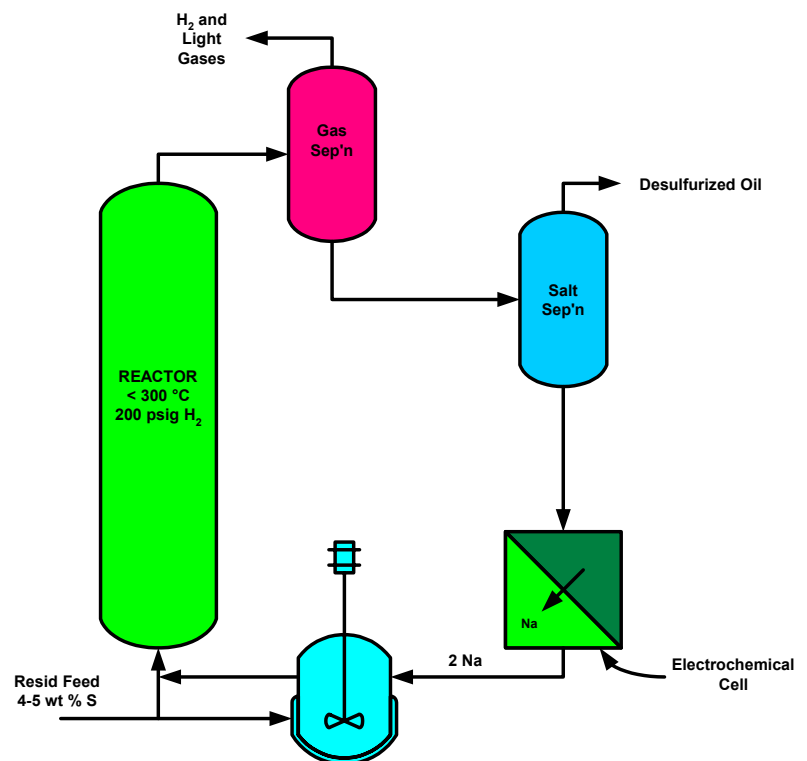
# TransFinning-R

## Novel Process for the Desulfurization of Bitumen and Heavy Oil

Since the last downturn in the oil industry in 1999, amazing changes have occurred in the energy arena. The price of light sweet crude oil has risen from \$10 per barrel to over \$70 per barrel, while the price of natural gas for industrial consumers has risen threefold. Despite these higher prices, demand for oil and gas remains strong, with little in the way of a cushion between supply and demand. This, in turn, has spawned substantial new rounds of investment in the production and upgrading of heavy, high sulfur crude oils.

However, even if significant quantities of heavy crude were to become available for U.S. consumption, our refineries are ill-equipped to handle these contaminant-filled materials. Further, the process of revamping existing facilities or building grass-roots units is fraught with legal and environmental hurdles that make it difficult, if not impossible, to get new projects completed. Yet, new capacity is required, both to meet demand and to comply with environmental regulations of governments worldwide aimed at reducing greenhouse gas emissions.

TransFinning-R is a revolutionary new three-step process for the desulfurization of heavy oil and bitumen; and initial work on this concept was supported by The U. S. Department of Energy. In the first step a chemical reagent is added to the feed; and desulfurization occurs under modest hydrogen pressure and at lower temperatures than traditionally used for hydrodesulfurization of heavy oil. The product comprises a desulfurized heavy oil and an inorganic sulfur-containing salt. In the second step, a proprietary solvent is used to selectively extract the salt from the oil; and in the third step, the salt is reconverted to the original chemical reagent (for recycle to the feed) in a proprietary electrochemical reactor which incorporates an Ion Transport Membrane. Removal of sulfur from tar sands bitumen or heavy oil prior to coking (the typical processing technique for these feeds) allows the coker to produce (1) a low sulfur distillate that needs little or no additional desulfurization and (2) a low sulfur coke that can then be burned or gasified to produce additional energy without the harmful environmental impact of high sulfur coke. TransFinning-R is expected to be commercially available 2011-2012.



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