

## Innovative oil process increases API, removes sulfur and other heteroatoms from crude oil.

**FlexUP™ Technology is a novel, catalytic process that offers the disruptive ability to upgrade heavy-sour crude oil, providing an increase in value as high as 5% -20%. It includes the FlexOX™ family of catalysts, the FlexDS™ chemical package and FlexUP Support Services.** FlexUP™ is an innovative leap in upgrading technology that operates at much lower costs than existing upgrading processes. Because FlexUP™ has a small footprint, oil producers can field upgrade heavy-sour oil while drastically improving their economics. FlexUP™ has been proven to be effective on many heavy-sour crude oils as well as bitumen and coal liquefaction product.

**Increase API gravity.** Increasing API gravity can increase the value of a crude by 5% to 20%. For example, raising oil sands bitumen API from 10 to 20 eliminates the need for diluent and can provide a revenue boost of \$10-\$20/bbl. Other heavy crudes will see benefits closer to the 5%-10% range.

**Sulfur Reduction.** Sulfur levels above 1% get discounted 2%-5% depending on many factors including sulfur level. FlexUP™ can target and achieve specific sulfur levels depending on the desired quality of crude oil, increasing the overall value of the oil.

**TAN Reduction.** For heavy-sour feeds that have naphthenic acid levels in the 3%-4% range, producers are forced to sell their crude at a discounted rate. Removing TAN not only increases value but allows crudes to be sold to a larger portion of the refinery market, not just complex refineries that are able to process high TAN.

**Metals and nitrogen reduction.** Crude with high metals and nitrogen content is discounted along with other entrained contaminants. While the life of the FlexOX™ catalyst is not reduced by contact with these heteroatoms, metals and nitrogen have an adverse effect on other catalytic processes downstream. FlexOX™ treated crude oil will allow the refiners to achieve longer catalyst life and reduced process intensity, thus increasing the value of the crude oil.

Auterra is working internationally with strategic energy companies looking to increase the value of their crude oil reserves. FlexUP™ Technology is currently in the pilot plant stage, and Auterra expects to have first FlexUP™ units installed in the field by 2016. Please contact Auterra for more information on FlexUP™ Technology, FlexOX™ catalysts, FlexDS™ chemical package or FlexUP Support Services.

**For more information, contact:**

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### FlexUP™ Highlights

- Increases API
- Removes sulfur, nitrogen, trace metals and lowers TAN
- Increases the value of crude up to 5%-20%
- Effective on heavy-sour crudes, bitumen and coal liquefaction product
- Small footprint, low capital cost

