

# Refinery - Metal Reduction Process Improvement

## 50% REDUCTION OF METALS UPGRADES COKE WHILE EXTENDING CATALYST LIFE

### BACKGROUND AND CHALLENGES

A refinery processing a very steady crude slate of East and West Texas Sweet, North West Louisiana production and periodic opportunity crudes had issues with metal content. The refiner passed the anode grade specifications on iron approximately 35% of the time. Athlon, a Halliburton Service, was asked to evaluate their system and make recommendations to assist the refinery to reduce the metals content.

### ATHLON'S RECOMMENDATION

Athlon has developed a desalting process designed to reduce the concentration of metals in anode grade coke. The process specifically targeted the iron content of the coke, but we found it also has benefits in reducing the vanadium content as well. The process is a combination of steady-state desalter operations coupled with our proprietary desalting process. It has the greatest effect on the metals content of the coke and other product streams.

Athlon's metals removal process for production of anode grade coke employs the use of an oil-soluble desalting demulsifier and the injection of caustic into the desalter washwater. The desalting demulsifier is injected upstream of the crude booster pump to help ensure sufficient distribution of the product. A strong base is added to the desalter washwater (Stripped Sour Water) prior to the mixing.

There are several key factors necessary for the successful implementation of this program. Those key factors are:

#### Optimum Desalting Aid Formulation

- » Must perform in high pH environment
- » Must provide high level of solids water wetting
- » Must demonstrate rapid water separation
- » Must demonstrate basic pH emulsion resolution

#### Adequate Water Droplet Population

- » Optimum washwater volume (7 - 8.5%)
- » Increased contaminant/water contact

#### Proper Oil/Water Mixing

- » Low energy mixing desired
- » Extended oil/water contact

#### Operator Involvement

- » Monitoring of effluent pH
- » Operator training to assume ownership

### PERFORMANCE RESULTS

In the past five years, we have employed this process and the incidence of elevated iron levels has been drastically reduced. Since the refinery implemented the Athlon process, more than 97% of the coke produced meets the iron specifications and is upgraded to anode grade.

A bonus benefit was the reduction of the vanadium content. Prior to Athlon's program, it averaged 75 ppm. Over the past five years, it averaged 50 ppm and has been above 100 ppm only three times. The reduction in the vanadium increases catalyst life valued in excess of USD \$1MM. Other benefits are reduced desalted crude sale content, reduced water carryover, reduced dependence on NaOH injection, and reduced neutralizer consumption. Accumulated date:

|                               | Desalted Salt | Overhead Chlorides | Brine Oil Content | Salt Removal Efficiency |
|-------------------------------|---------------|--------------------|-------------------|-------------------------|
| Pre-Athlon                    | 1.5 to 4 ptb  | 35 to 50 ppm       | Percentage        | 97 to 98%               |
| Athlon, a Halliburton Service | 0.5 ptb       | 5 ppm              | <200 ppm          | >99%                    |

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