

## EP™ 2500

For Heavy Crude Oil

### Background

EP™ 2500 Flow Improver is the latest addition to the portfolio of innovative Flow Improver solutions for heavy crude oils offered by LiquidPower Specialty Products Inc. (LSPi). This pioneering product provides best-in-class drag reduction (%DR) and enables maximum flow increase.

Built on the legacy of EP™ 2000, EP™ 2500 is a reliable drag reducing agent (DRA) designed for pipelines transporting typical heavy crude oils (<23° API). In demanding applications where the highest %DR is required, EP™ 2500 is the product of choice. It has been shown to achieve higher %DR than EP™ 2000 when deployed in similar operating conditions.

### Characteristics

EP™ 2500 Flow Improver is an aqueous dispersion. Its storage stability and injection reliability are excellent, on par with those of EP™ 2000. Combined with its high affinity for heavy crude oils, the robust characteristics of EP™ 2500 make it the highest-performing drag reducer for heavy crude applications.

This innovative product can provide greater than 50% drag reduction, depending on crude oil characteristics and the level of turbulence in the pipeline. EP™ 2500 allows pipelines to increase throughput, decrease pressure, and shut down pumps to manage crude oil temperatures.

### Benefits

#### Great Performance:

- Achieves 50% drag reduction under certain conditions
- Increases flow rate while maintaining pipeline pressure
- Maintains flow rate while reducing pipeline pressure
- Allows shutting down of intermediate pump stations

#### Superior Technology:

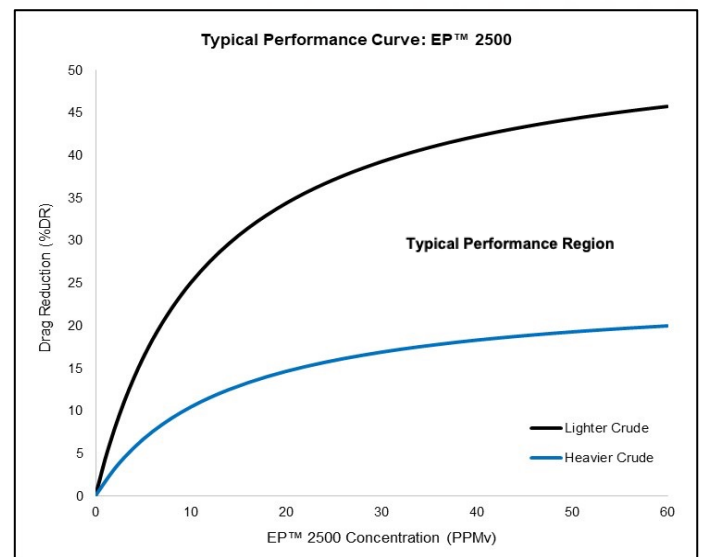
- Improves pipeline capacity without capital investment
- Enables crude thermal management activities

The successful application of EP™ 2500 Flow Improver requires transition or turbulent flow regime in a portion of the pipeline system, heavy crude oil/DRA polymer affinity, and a suitable pipeline system configuration.

The polymer technology developed by LSPi allows greater amounts of active polymer to be deployed in a fixed amount of product. The polymer of choice shows excellent heavy oil hydrocarbon affinity and is able to attain elevated levels of drag reduction under varied operating scenarios. It also has the strength to effectively endure shear forces. EP™ 2500 Flow Improver dissolves into the flowing product without coating the pipeline walls.

### Handling

EP™ 2500 Flow Improver is easy to handle, store, and clean up. It is non-flammable, flows easily, and does not require nitrogen pressurized storage tanks.



This performance curve demonstrates the range in which EP™ 2500 Flow Improver can operate, depending on pipeline and fluid conditions.

# EP™ 2500

## Product Properties



### GENERAL

|                    |                           |
|--------------------|---------------------------|
| Application        | Heavy petroleum crude oil |
| Flow Improver Type | Dispersion                |
| Carrier            | Water and glycol mixture  |

### PERFORMANCE

|                        |                  |
|------------------------|------------------|
| Maximum Drag Reduction | Greater than 50% |
| Typical Concentration  | 5 to 100 ppm     |

### TYPICAL PROPERTIES

|                 |  |
|-----------------|--|
| Color           | White  |
| Density         | 8.0 – 8.5 lbs/gal (0.96 – 1.02 g/cm <sup>3</sup> ) |
| Typical Density | 8.3 lbs/gal (1.00 g/cm <sup>3</sup> )              |
| Flash Point     | > 200°F (> 93.4 °C)                                |
| Viscosity       | 120 cP @ 511s-1 (non-Newtonian) @ 77°F / 25°C      |
| Freezing Point  | -9°F (-23 °C)                                      |
| Boiling Point   | 223°F (106°C)                                      |
| Vapor Pressure  | 0.46 psia (24 mm Hg) @ 77°F / 25°C                 |

### HANDLING

|                      |  |
|----------------------|--|
| Operating Range      | -9°F to 140 °F (-23°C to 60°C)   |
| Product Stability    | Stable dispersion<br>No agitation required   |
| Pressure and Heating | No nitrogen or pressurized vessels required<br>Climate control environment available |

### INJECTION EQUIPMENT

|            |  |
|------------|--|
| Pumps      | Various designs available for different injection range and environments |
| Range      | 5 to 2,500 gal/day (20 to 9,500 L/day)                                   |
| Flow Meter | Mass (Coriolis)  |
| Automation | Available  |

### SAFETY AND ENVIRONMENTAL

#### Reference country specific Safety Data Sheet for local requirements

|                 |  |
|-----------------|--|
| Safety & Health | Nonflammable. This material is classified as hazardous under the criteria of the U.S. OSHA Hazard Communication Standard 29 CFR 1910.1200. |
| Environmental   | Uncontaminated waste product is non-hazardous as defined by U.S. EPA.  |

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