

## LP™ Arctic Grade™ For Crude Oil in Cold Climates

### Background

LP™ Arctic Grade™ Flow Improver is part of the LiquidPower Specialty Products Inc. (LSPI) range of innovative and technologically superior Flow Improver Solutions. As part of the portfolio, LP™ Arctic Grade™ Flow Improver has been designed for use in very cold environments.

### Characteristics

LP™ Arctic Grade™ Flow Improver is a nonaqueous-based suspension DRA with exceptional freeze protection. It is suitable for applications where temperatures may fall to -40 °F (-40 °C). As part of LSPI's LiquidPower® Flow Improver portfolio, it can provide greater than 80% drag reduction.

LP™ Arctic Grade™ Flow Improver allows companies to strategically reduce pipeline operating costs, increase throughput, decrease pressure or shut down intermediate pump stations.

LP™ Arctic Grade™ Flow Improver offers the same advanced polymer technology as other LiquidPower® Flow Improvers. It dissolves into flowing product without coating pipeline walls. It allows greater amounts of active polymer to be deployed in a fixed amount of product while improving dissolution dynamics. The polymer of choice offers excellent 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.

### Handling

LP™ Arctic Grade™ Flow Improver is easy to handle, store and clean up. It flows easily and does not require nitrogen pressurized storage tanks.

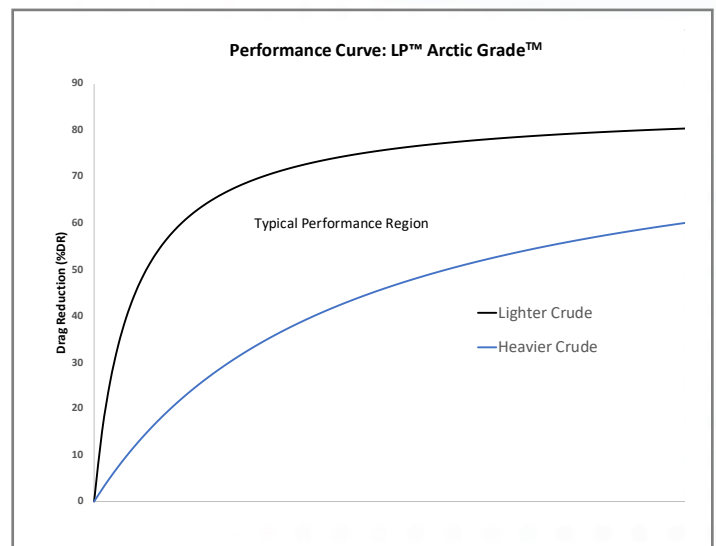
### Benefits

#### Great Performance:

- Provides additional buffering from shear effects
- Increases flow rates while maintaining current pipeline pressures
- Maintains flow while reducing pipeline pressures
- Allows shutting down of intermediate pump stations

#### Superior Technology:

- Improves pipeline capacity without capital investment
- Less polymer required to achieve a given performance
- Lower injection rates than other drag reducers
- Faster dissolution rates than other drag reducers
- Reduces crude oil heat loss



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

# LP™ Arctic Grade™

## Product Properties



### GENERAL

|                    |  |
|--------------------|--|
| Application        | Petroleum crude oil in arctic conditions |
| Flow Improver Type | Suspension                               |
| Carrier            | Primary alkyl alcohol                    |

### PERFORMANCE

|                        |                  |
|------------------------|------------------|
| Maximum Drag Reduction | Greater than 80% |
| Typical Concentration  | 5 to 50 ppm      |

### TYPICAL PROPERTIES

|                |   |
|----------------|---|
| Color          | White   |
| Density        | 7.3 lbs/gal (0.88 g/cm <sup>3</sup> )                     |
| Flash Point    | 181 °F (83 °C)  |
| Viscosity      | 150 cP @ 511s <sup>-1</sup> (Non-Newtonian) @ 77 °F/25 °C |
| Freezing Point | <-40 °F (<-40 °C)   |
| Boiling Point  | 365 °F (185 °C)   |
| Vapor Pressure | 0.02 psia (1.0 mm Hg) @ 100 °F/37.8 °C                    |

### HANDLING

|                      |  |
|----------------------|--|
| Operating Range      | -40 °F to 95 °F (-40 °C to 35 °C)  |
| Product Stability    | Stable suspension<br>Intermittent agitation required   |
| Pressure and Heating | No nitrogen or pressurized vessels required<br>Heating tracing and heating required under freezing conditions<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 (per U.S. OSHA) | Combustible liquid. This material is classified as hazardous under the criteria of the U.S. OSHA Hazard Communication Standard 29 CFR 1910.1200.        |
| Environmental                   | This material is classified as an environmental hazard per GHS. Uncontaminated waste product is non-hazardous as defined by the U.S. EPA RCRA criteria. |

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**North America, Latin America**  
LiquidPower Specialty Products Inc.  
2000 W. Sam Houston Pkwy S.  
Fourth Floor, Suite 400  
Houston, TX 77042 USA  
Tel: +1 713 339 8703  
+1 800 897 2774 (USA toll free)

**Europe, Middle East, Africa and Asia Pacific**  
Medialaan 50  
1800 Vilvoorde (Brussels)  
Belgium  
Tel: +32 2 263 0520  
Fax: +32 2 267 5176

**Russia and CIS**  
LiquidPower Specialty Products Inc.  
Zemlyanoy Val, bld. 9  
BC Citydel, 4th floor, office 4003  
Moscow, Russia, 105064  
Tel: +7 495 9679335  
Fax: +7 495 9679373