

LP™ Winter

For Crude Oil in Cold Climates

Background

LP™ Winter Flow Improver is part of the Lubrizol Specialty Products, Inc. (LSPI) range of innovative and technologically superior Flow Improver Solutions. As part of the portfolio, LP™ Winter Flow Improver has been designed for use in colder environments.

Characteristics

LP™ Winter Flow Improver is an aqueous suspension product with freeze protection, suitable for use in cold, winter environments. Like other LP™ Flow Improvers, it can provide greater than 80% drag reduction.

Benefits

Great performance:

- Drag reduction with freeze protection.
- Suitable for use in cold, winter environments.
- Greater than 80% drag reduction.
- 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 internal corrosion rate by 40%.
- Reduces crude heat loss.

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

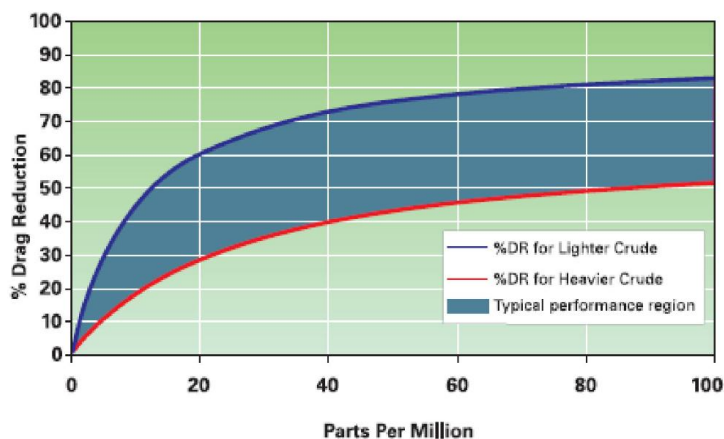
LP™ Winter Flow Improver offers the same advanced polymer technology as other LiquidPower™ Flow Improvers. It dissolves into flowing product without coating pipeline walls and increases throughput while reducing internal corrosion rates. It allows greater amounts of active polymer to be deployed in a 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 endure shear forces effectively.

Handling

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

See back page for product properties.

Performance Graph



The performance curve shows the performance range in which LP™ Winter Flow Improver operates, depending on pipeline and crude conditions.

LP™ Winter

Product Properties

GENERAL

| | |
|---------------------|--------------------------------------|
| Designed for use on | Light and Medium petroleum crude oil |
| Flow Improver type | Suspension |
| Carrier/Solvent | Water-glycol mixture |

PERFORMANCE

| | |
|------------------------|------------------|
| Maximum drag reduction | Greater than 80% |
| Typical concentration | 5 to 50 ppm |

TYPICAL PROPERTIES

| | |
|----------------|---|
| Color | White |
| Density | 8.0 lbs/gal (0.96 g/cm ³) |
| Flash Point | Not applicable |
| Viscosity | 375 cP @ 511s ⁻¹ (Non-Newtonian) @ 77°F/25°C |
| Freezing Point | 14°F (-10°C) |
| Boiling Point | 221°F (105°C) |
| Vapor Pressure | 0.46 psia (23.8 mm Hg) @ 77°F/25°C |

HANDLING

| | |
|-------------------|---|
| Operating range | 14°F to 90°F (-10°C to 32.2°C) |
| Product stability | Stable suspension Intermittent agitation recommended |
| Pressure | No nitrogen or pressurized vessels required |
| Heating | Climate control environment available |

INJECTION EQUIPMENT

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|------------|--|
| 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.

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|------------------------------------|---|
| Safety & Health (per U.S. OSHA) | Nonflammable; Nonhazardous Low toxicity. Conventional protection equipment |
|------------------------------------|---|

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|---------------------------------|-----------------------------------|
| Environmental (per U.S. EPA) | Not classified as hazardous waste |
|---------------------------------|-----------------------------------|