DRAG REDUCING AGENT

BACKGROUND

[0001] Where fluids are transported over long distances, such as in oil pipelines and other hydrocarbon liquid pipelines, substantial turbulence and wall friction is created. These friction losses result in inefficiencies that increase equipment and operations costs. Known are drag reducing agents (DRAs) that reduce the turbulence-mediated friction and eddies, which, in turn, decreases friction losses and pressure drop in hydrocarbon liquid pipelines. Drag reducing agents are typically ultra-high molecular weight polymers (greater than 5,000,000 g/mol) with the ability to dissolve in a hydrocarbon under turbulent flow.

[0002] Ziegler-Natta catalyst systems are used to produce conventional DRAs. However, the production of ultra-high molecular weight polymers by way of Ziegler-Natta catalysis is subject to several drawbacks. Ziegler-Natta catalysis for ultra-high molecular weight polymers is inefficient as polymerization temperatures are typically low and reaction times are long in order to produce the high molecular weight polymer needed for the application. Furthermore the polymer is typically broad in molecular weight distribution and final polymer properties are often difficult to control.

[0003] The art recognizes the need for drag reduction agents produced by way other than Ziegler-Natta catalysis. Further recognized is the need for high-molecular weight polymers effective for drag reduction with narrow molecular weight distribution.

SUMMARY

[0004] The present disclosure provides a drag reducing agent. The drag reducing agent includes a polymer and a liquid carrier. The polymer is composed of one or more C_6-C_{14} α-olefin monomers. The polymer includes a residual amount of zirconium. The polymer has an absolute weight average molecular weight ($Mw_{(Abs)}$) greater than 1,300,000 g/mol and a $Mw_{(Abs)}$/ $Mn_{(Abs)}$ from 1.3 to 3.0.

[0004a] In one aspect, the present disclosure provides a drag reducing aent comprising: from 10 wt% to 80wt% of a polymer consisting of (i) one or more C_6-C_8 α-olefin monomers, and (ii) a residual amount of zirconium, wherein the residual amount of zirconium is from greater than 0 ppm to 300 ppm, wherein the polymer comprises 0 ppm titanium, the polymer having an absolute weight average molecular weight ($Mw_{(Abs)}$) greater than 1,300,000 g/mol and a $Mw_{(Abs)}$/ $Mn_{(Abs)}$ from 1.3 to 3.0; from 20 wt% to 90 wt% of a liquid carrier; and the drag reducing agent has a viscosity at 100°C from $2.9014*10^{+05}$ m-Pas to $3.573*10^{+07}$ m-Pas.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] FIG. 1 is a schematic representation of the experimental set-up for evaluating drag reduction in accordance with an embodiment of the present disclosure.

CLAIMS

1. A drag reducing agent comprising:

from 10 wt% to 80wt% of a polymer consisting of

(i) one or more C_6-C_8 α-olefin monomers, and

(ii) a residual amount of zirconium, wherein the residual amount of zirconium is from greater than 0 ppm to 300 ppm,

wherein the polymer comprises 0 ppm titanium,

the polymer having an absolute weight average molecular weight ($Mw_{(Abs)}$) greater than 1,300,000 g/mol and a $Mw_{(Abs)}$/ $Mn_{(Abs)}$ from 1.3 to 3.0;

from 20 wt% to 90 wt% of a liquid carrier; and

the drag reducing agent has a viscosity at 100°C from $2.9014*10^{+05}$ m-Pas to $3.573*10^{+07}$ m-Pas.

2. The drag reducing agent of claim 1 wherein the polymer has 0 ppm titanium.

3. The drag reducing agent of claim 1 or 2 wherein the polymer has from greater than 0 ppm to 300 ppm germanium.

4. The drag reducing agent of any of claims 1-3 wherein the polymer is selected from the group consisting of octene homopolymer and hexene homopolymer.

5. The drag reducing agent of any of claims 1-4 wherein the liquid carrier is selected from the group consisting of a linear C_4-C_{16} aliphatic hydrocarbon, a branched C_4-C_{14} aliphatic hydrocarbon, a ringed C_4-C_{16} aliphatic hydrocarbon, and combinations thereof.

6. The drag reducing agent of any of claims 1-5 wherein the polymer contains zirconium and boron.

7. The drag reducing agent of claim 6 wherein the polymer contains germanium.