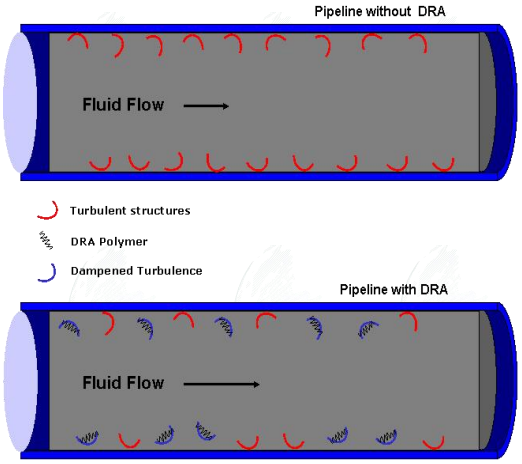
Drag Reducing Agent

1. Technical background

Pipeline transportation of crude oil is a safe, convenient, fast, environment-friendly, investment saving and energy-saving transportation method, which is less restricted by region and natural environment. However, pipeline transportation also has some shortcomings and a series of problems to be solved. For example, the elasticity of transmission capacity is small, the pressure resistance of the pipeline is reduced, and maintaining the transmission capacity may bring hidden dangers to the pipeline, All these affect the oil transportation volume. Oil soluble drag reducer is a kind of high molecular weight polymer. Its main function is to reduce friction resistance, reduce energy consumption and increase crude oil transportation capacity. Injecting drag reducing agent into crude oil can speed up the injection speed, save energy and shorten the working cycle, reduce energy consumption during transportation and improve the safety factor of the pipeline.

2. Technical principles



The fluid flow in the pipe is divided into three parts along the radial direction. The center of the pipe is the turbulent core. Most of the fluid particles in the pipe move disorderly and collide with each other in the forward movement. Near the pipe wall is the bottom layer of the laminar flow. The liquid particles move forward in layers. The turbulent vortex and the bottom layer of the laminar flow can be used as the buffer zone of the fluid flow. It is the transition state of the fluid from turbulence to laminar flow. The transition region is the region where the laminar flow changes first to the turbulent flow, and the region near the transition region in the lower laminar flow layer becomes the "thin layer". Occasionally, liquid molecules in the thin interlayer will be mixed into the transition zone, and then vortex will be formed with vibration. At the same time, the fluid flow speed will become faster, moving towards the turbulence center, and finally entering the turbulence center. The fluid molecules in the "thin interlayer" enter the turbulent center region from the transition region, and will consume huge energy instantly.

The drag reducer for Anton crude oil gathering and transportation is an oil-soluble polymer, which exists in the crude oil in a curled state, and the polymer molecules in this state are elastic. Due to the existence of drag reducing agent, all levels of vortices in the crude oil in the turbulent center transfer energy to the drag reducing agent molecules, making them elastically deformed and storing energy. These energy can be released during the stress relaxation of drag reducer, and return to the corresponding vortex to maintain the turbulent state of crude oil, so as to reduce the energy that must be provided by the outside world to maintain this state, so as to achieve the purpose of drag reduction. Therefore, only when the crude oil is in a turbulent state, the drag reducer can reduce the drag.

3. Technical features

It is compounded by a variety of surfactants with strong ability to dissolve wax, resin and asphaltene;

It mainly reduces viscosity and prevents wax of emulsified crude oil;

The product can reduce turbulence, reduce friction, improve pipeline transportation capacity, and save energy and consumption.

4. Technical indicators

Items	Specifications
Appearance	Amber to Dark Brown Liquid
Specific gravity (20 ℃)	0.8 -1.1
Pour point:	<0
Solubility:	Oil Soluble
Flash point: 0C	>60°C

5. Scope of application

It is suitable for crude oil transportation in long-distance pipelines, metering and distribution stations, etc.

6. Cases

**In the * * well in the * * oil production area of the oilfield, since the crude oil was transported by pipeline on July 10, the outlet pipe pressure of the export pump continued to rise from 1.9mpa to 4.0Mpa, affecting the safety production.

Anton developed drag reducing agent products, evaluated and screened them according to the conditions of * * well, selected suitable drag reducing agents, and solved the problem of poor oil fluidity on site. The field experiment was conducted from October 26 to November 1, 2020. According to the field investigation and analysis, due to the use of repaired oil pipes in the export pipeline of the well, the smoothness of the inner wall of the pipeline is limited, which is easy to cause scaling and wax deposition; Three pipes are connected in parallel for oil transportation, resulting in increased oil pipe surface, large heat dissipation area and large temperature loss.

**Data sheet of physical parameters of well crude oil

Test time	Density (20 ℃)/ g/cm3	Viscosity (50 ℃) /mpa · s	Freezing point /℃	Wax precipitation point /℃	Wax content /%	Colloid /%	Asphaltene /%	Sulfur content /%
2020-7-22	0.8059	1.836	-28	18	13.1	0.20	0.02	0.117

It can be seen from the table that the crude oil is basically thin oil, with a wax content of 13.1%. It flows in the pipeline, and the temperature becomes lower. It is easy to cause wax deposition on the pipe wall after reaching the wax precipitation point.

1. Adjustment of dosage and concentration in this experiment:

Date / Time	Oct. 27th 11:00	Oct. 28th 14:00	Oct. 29th 22:00	Oct. 31st 14:00	Remarks
Dosage l/h	1.27	1.04	1.29	0.36	
Converted conc. ppm	70	60	75	20	

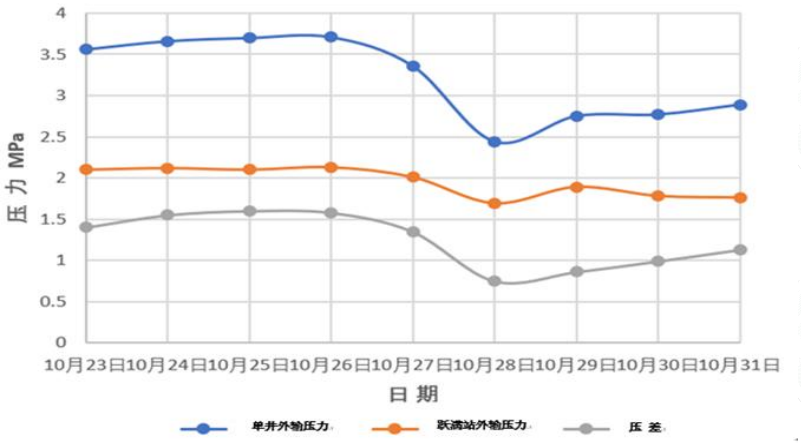
2. Frequency optimization:

From October 23 to 31, the change trend of daily frequency (average value) before and after the dosing of * * well → gathering station pipeline is shown in the figure below. From the trend analysis, the oil delivery volume changes little after the dosing on October 27. On the 27th, after dosing, the frequency decreased significantly, the motor speed decreased, the output power decreased, and the pipe wear resistance decreased after dosing, saving energy consumption.

Change trend of motor frequency before and after dosing

3. Well**: Pressure Changes of well and gathering station:

As can be seen from the following figure, the variation trend of well export, gathering and transmission station export and differential pressure decreases by nearly 1 MPa after the dosing of * * well export pipeline. Due to the low dosing concentration, the gathering and transmission station export decreases by 0.2 ~ 0.6 MPaThe pressure difference of the well and gathering station is reduced by 0.5 ~ 1.0 MPa.



**Trend chart of well export pressure, gathering station export pressure and differential pressure