Gas Drag Reducing Agent DRA-039G.

General Information:

Gas Drag Reducing Agent is a chemical additive that reduces resistance to gas flow and increases gas supply by up to 30%.

Gas Drag Reducing Agent performs two main functions:

1) Reduces the roughness of the inner surface of the pipeline;
2) Reduces the turbulence of natural gas in contact with the pipeline wall by streamlining the molecular motion of the gas;

Product information:

The DRA-039G Series is a highly effective chemical additive that can significantly reduce gas flow resistance and increase gas flow capacity in the pipeline. DRA-039G Series is a white-yellow emulsion liquid, neutral (PH = 6-8), non-flammable, non-explosive, non-corrosive, non-oxidizing, non-radioactive, low-toxic, harmless, non-psychotropic and non-narcotic. Its flash point is 65℃ and freezing point is ℃ -55℃, which is suitable for land, sea and air transportation.

Name: Gas Drag Reducing Agent DRA-039G
Composition of the product: 35-45% polymer, 50-60% octanol, 3% dispersant, 2% surfactant
The expiration date: 12 months.

DRA-039G Product Specifications:

Features:	Standard indicators:	Test indicators:
Reducing resistance to gas flow	10~20%	15%
Increase of gas pipeline throughput capacity	15%-30%	22%
Pour point	< -50℃	-55℃
Flash point (closed cup)	≥60℃	65℃
Viscosity (20℃, 50s-1,), mPa s	< 200	45

Density	1.0~1.20	1.12
Appearance	Yellow liquid	Yellow liquid

Efficiency:

The work principle of the DRA-039G Series is that the additive forms a smooth and elastic film on the inner wall of the gas pipeline, this allows to reduce the friction resistance of gas against the pipe wall. As a result, the throughput capacity of the gas pipeline is increased.
The final user, according to the actual needs and condition of the pipeline, can control and set the pressure, thus influencing the flow capacity of the pipeline. Generally, because of the additive mechanism, it is possible to increase the pipeline capacity while maintaining the operating pressure, or it is possible to reduce the operating pressure of the pipeline while the pipeline capacity remains unchanged. Depending on the condition of the pipes, the effect of resistance reduction will be different.
The average resistance reduction rate in mass production is 15% ~ 20%¸ and the increase in gas pumping is 20-25%. If this product is used correctly over a long period of time continuously, there is a tendency of positive accumulation effect on the increase of the drag reduction factor.

Notes:

DRA-039G is a mixture which mainly consists of a polymer and is supplemented with octanol, dispersant and surfactant. The additive is good at reducing resistance and increasing flow capacity in various gas pipelines, has good compatibility with other chemical additives used by final users.

The applied amount of DRA-039G is very small, at the ppm level. During use, the additive is first adsorbed on the pipe wall and then gradually carried away by the gas flow. The applied amount is so small that it does not have a harmful effect on the pipeline and the gas itself.

The specialists of Liaoning University conducted studies confirming the absence of a negative impact on the characteristics of the treated gas, such as:

1) Study on the effect of DRA-039G on the inner wall of the pipeline;
2) Study on the impact on post-processing systems;
3) Study on the impact on the quality of natural gas;

Instruction manual:

Below is the formula for calculating the injection volume:
$\mathbf{Q = 3.14 \times D \times L \times \mu \times K}$

Q - injection volume of the DRA-039G (м^3)
D - pipe diameter (m)
L - pipe length (m)
μ - DRA-039G film thickness (5×10^{-5} (m))
K - the injection coefficient (usually 2).

Example №1: The pipeline has a diameter of 0.5 meters, the length is 100 kilometers, and 15.7 tons of DRA-039G is pumped at one time.

$Q = 3.14\times0.5\times10^5\times5\times10^{-5}\times2 = 15.7$ tons

Normally, the DRA-039G has a duration of about 60 days, needs to be injected once every 60 days, and needs to be injected 6 times a year. For a pipeline with a diameter of 0.5 meters and a length of 100 kilometers, the total annual injection volume is 94.2 tons.

Q annual volume = 15.7×6 =94.2 tons

Gas Drag Reducing Agen DRA-039G can also be used on a regular basis. But for economic efficiency, it is recommended to use once with periodic repetitions due to the fact that the DRA-039G is gradually carried away by the gas flow.

<u>EXAMPLE №2: Technical specifications of the gas pipeline (project in Canada):</u>

Diameter of the pipe Φ	325 mm
Pipeline length	500 km
Estimated pipeline pressure	6.4 MPa
Operating pressure of the head station	6.1MPa ~ 6.25MPa
Estimated performance	2.3 million m3/day
Actual throughput	2.55 million m3/day

Canadian company buys 306 tons of the DRA-039G at a time (51 tons per injection, 6 injections per year).
DRA-039G is injected from the gas gathering station, where the pigging station is installed (pipeline pigging, cleaning is usually performed without stopping the product flow in the pipeline). Before the DRA-039G is injected, the pipeline is cleaned with pigs. The product transported through the pipeline is natural gas that has been cleaned and treated through CPF gas filters.
The pumping rate is 200 liters per hour and the pumping time is about 51 hours. The additive has to be added every 100 km, a total of 5 gas injection stations are required, 10.2 tons at a time should be pumped to each point. After adding the DRA-039G, the working pressure is reduced by 10% and the volume of gas supply is increased by 15%, the drag reducing coefficient is 10%.
After 60 days, the drag reducing coefficient was 6% and the gas supply volume was 10%. After reusing the DRA-039G, 51 tons of reagent was injected again, the drag reducing coefficient returned to 10%, and the gas supply volume returned to 15%.

Q = 3.14×D×L× μ ×K $=3.14\times0.325\times500000\times5\times10^{-5}\times2=51$ tons

In addition to the successful experience with the DRA-039G in Canada, the product has also been used at the following large projects:

1) China's Second West-East Gas Pipeline;
2) The first line of Shaanxi-Beijing gas pipeline;
3) Lanzhou-Yinchuan Gas Pipeline, Qiangzhou-Zibo Gas Pipeline;
4) In the Changqing oilfield gathering and transportation pipeline.

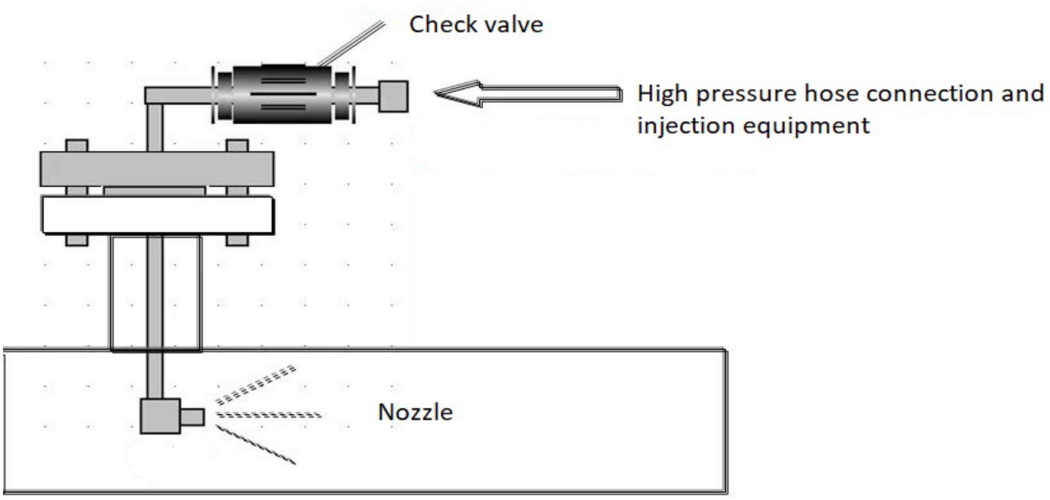
Product packaging and transportation:

1) IBC cube

Installation of the spray nozzle into an existing gas line:

The standard injection equipment used for additive (for oil) is also quite suitable for the DRA-039G injection. Engineers have developed a technique where a high efficiency fine atomizer is installed at the injection point, going to the center of the pipe.

Picture 1: Schematic representation of the atomizer on the gas line.



A picture of the atomizer: