



Questions & Answers

How does FloWell Work?

To know how FloWell works you first have to understand the underlying cause of the problem. As temperature lowers in the oil stream molecules of paraffin are attracted to each other forming long chains which then create crystals which are the basis of the precipitation produced. Added heat is often used as a solution and additional extremely hazardous solutions (xylene) are also used. To return the precipitation to liquid form it is necessary to break the molecular chain and this is what FloWell does. This is not a temporary solution as FloWell permanently locks the paraffin in liquid phase.

Why does FloWell use water which is not compatible with oil?

The active ingredients in FloWell require a carrier to distribute the active components within the oil stream. Water is an ideal medium because it is safe, giving the solution its hazmat rating of 000. It also is an inexpensive carrier medium because of the large volumes required and is readily mixed into the oil stream due to the surfactants contained within the solution. The key to the success of FloWell is the rapid distribution through the oil streams to make contact with the paraffin content.

Is there not a risk of emulsification?

One of the characteristics of FloWell is its ability to prevent emulsification. Tests have shown that when FloWell is introduced to the oil stream, after it has reacted with the paraffin, it actually enhances the ability to expel water from the oil stream. Laboratory tests have shown that oil laden solids in a glass container when subjected to a FloWell water solution causes the oil to detach from the solids and rise to the surface of the liquid. Even oil particles that tend to be held in suspension are driven to the surface thus making it perfect for increasing the efficiency of water separators.

What are the conditions required for the application of FloWell?

Turbulent conditions are ideal because the intent of the FloWell application is to distribute thoroughly through the oil flow enabling the solution to reach the paraffin content. This is why FloWell is best applied at the well, prior to pumps or where conditions of turbulence (change of direction in pipe flows) occur. Temperature is not essential, however as temperature reduces viscosity and lower viscosity aids the mixing of the FloWell solution then the higher the temperature of the oil the better.

Why is FloWell better than our current methods?

Generally, paraffin precipitation is resolved in a corrective application. This quite often means mobilisation/demobilisation followed by downtime of which the consequence is loss of production. FloWell works differently. FloWell actually returns precipitation to liquid phase whilst it is already neutralising the paraffin from precipitation regardless of the temperature. If used on a continuous

basis then there is no need ever to stop production (depending on the production facilities) meaning the revenue stream is not interrupted.

Which is better continuous preventative or occasional corrective application?

Everything depends on the application. Not every application has the facilities for continuous preventative application however every effort must be made because as precipitation begins to grow then production flows reduce. These reductions cannot be recovered and are therefore considered financial losses. If continuous preventative application is applied then production flows are continuous and the prevented loss pays for the application. In most cases preventative application more than pays for itself in many different ways.

What additional benefits are gained with the use of FloWell?

One of the biggest problems found in production is that when the oil flow is halted for any reason (maintenance) then the cooling oil in the pipeline becomes sluggish creating enormous problems on restart. Considering the velocity of the oil through the pipeline has shown to be like an elliptical curve where the slowest flow (almost, if not zero) is at the outside against the walls and the fastest flow is in the centre or the core of the flow, then it stands to reason that it will take a long time to displace the cooled oil with new heated flow.

An application in the Gulf of Mexico showed that FloWell resolves these problems. During the application the production had to be stopped for a couple of days for important maintenance work. Previous experience had shown that it took up to 2 weeks for the flows to return to normal. To the amazement of the production staff full flow was achieved within a couple of hours of turning the pumps on.

What equipment is required for the FloWell application?

This is entirely dependent on how FloWell can be applied at the asset. At the very worst we have had to use FloWell treated oil (FWTO) where the FloWell is premixed into oil and then pumped down the annulus of the well into the oil stream. The best application is by metered pumps injecting into the oil stream at the best possible point prior to where paraffin precipitation becomes a problem. If using a metered pumping system then generally existing equipment can be used. Every application has to be reviewed not only for application methodology but also difficulties that may be found when reviewing the application.

What is the dosage rate for the FloWell application?

Every application is different and on completion of the questionnaire and in receipt of additional requested data a technical application specification will be created for that project. It must be understood that each application has to be studied in isolation as what is good for one project may not be good for the next even on the same type of application in the same area or field of assets. The dosage rate for a preventative/corrective application will be different than for a new preventative application. A higher dose rate may be required for the initial corrective side of the application and then whilst monitoring at a regular basis the dose rate is reduced until the minimum required to maintain the prevention of precipitation is reached.

How do you determine the dosage rate?

There is a basic rule of thumb where we will begin an application for light/medium crude oil using approximately 150 PPM to 200 PPM of FloWell. We discovered long ago that FloWell is extremely efficient and a little care has to be taken to ensure that we apply the most effective dose. The reason behind this is that we had an application on a pipeline where we exceeded the effective

dose as an experiment after enjoying many weeks of continuous production increase. We were puzzled when flow began to reduce and as we increased the dose even further suspecting there may be something wrong with the FloWell solution yet the flow decreased a little more.

Our applications engineer made the decision to reduce the dose back to previous settings where to his astonishment the flow rate began to increase again. How could this be? It was discovered on analysis that the FloWell was releasing so much contamination that it was displacing the oil flow. The more we added, the more we displaced, the more the flow dropped. From that point a lower dose was applied and previous increases continued confirming that we were indeed removing the existing contamination in the pipeline.

Finally, we understood that we needed to continuously monitor the telemetry adjusting the FloWell dose until we achieved the results we required. This meant on cleaning applications we stopped increasing and backed off if the flow declined and on preventative applications, we lowered the dose until we noticed a decrease in flow then increased marginally to prevent further precipitation. Once the desired result was achieved then only occasional monitoring and maintenance was required.

This provided us with two very important pieces of information. The first was that FloWell was so efficient that higher than normal doses caused flow to reduce due to displacement. Secondly, we understood that we needed to continuously monitor the telemetry adjusting the FloWell dose until we achieved the results required.

We are using DRA or similar is that a problem?

We have found that FloWell is not compatible with DRA and this was found to be the case in a pipeline project. We began a FloWell application and for almost a week there were no results to show. We identified that the DRA application was still on-going.

We requested for it to be discontinued for a short while where we studied the results. Astonishingly the oil flow rose exponentially for the next 10 days. After this period the flow levelled out. We identified that there was a bottleneck with a huge amount of contamination at the very beginning of the flowline and this was rapidly cleared because it was an area of extreme turbulence.

Once this bottleneck was cleared the FloWell then began working on the long-standing contamination within the main pipeline itself. This identified unequivocally that there are certain treatments being used in the oil and gas industry that are not compatible and impede the ability of FloWell to do its job.

The DRA had previously only been reducing the amount of loss in flow and had not been resolving the problem. When it was discontinued in favour of FloWell that is when results began to show.

What is the difference between FloWell and DRA?

DRA is a drag reducing agent which requires laminar flow for it to work efficiently. It does not however address the basic problem which is the build-up of paraffin precipitation. The loss of flow is caused by loss of capacity which is more serious than drag created by increasing viscosity. If turbulence is experienced any time along the pipeline it depletes the effect of the drag reducer and reapplication, if possible, of DRA is necessary.

FloWell however thrives on turbulence as it helps distribute the active components enabling them to meet the paraffin neutralising any precipitation. Additionally, FloWell returns existing paraffin precipitation to liquid phase increasing the bore size which leads to additional flow capacity.

An additional feature of FloWell is that it tends to marginally decrease viscosity also which is an additional bonus. Once FloWell is applied and does its work it maintains paraffin in liquid phase all the way to the refinery. No additional intervention is required.

Can we expect extra production from the use of FloWell?

Everything depends on the application itself. We are going to show here an unusual application where FloWell has indeed increased production over and above what was expected.

Case Study:

We began an application on a gas lift -assisted oil well in the Gulf of Mexico where we had to inject FloWell into the gas stream via the annulus. The FloWell application was successful in cleaning the tubing and outgoing pipeline and was being used on a continuous preventative basis.

This was a multiphase well so it was producing water and gas in addition to the oil. During the application, for maintenance purposes, it was decided to shut in the well temporarily. However, during this period, the gas was continually being applied keeping the well under pressure and of course the FloWell was still being added to the gas flow.

When the well was restarted, to the astonishment of the production crew, the produced water content had reduced by 30% and a similar amount of reduction in the produced gas. The reduction in produced water content was replaced by produced oil much to the delight of the client.

This was short lived and an investigation was made to identify this phenomenon. It was discovered that because the gas injection was still under pressure the FloWell contained was driven into the formation. As we know that FloWell assists in the migration of water within oil it was assumed that what had happened was entrained water was encouraged by FloWell to drop to the bottom of the formation (basic physics) and the entrained gas was released and rose to the cap.

As soon the FloWell that had been forced into the formation was depleted, then previous production figures returned. Although it was exciting to get this result it was considered impractical to do this on a regular basis because it meant interrupting production to achieve this result.

Are there any precautions to be taken during a FloWell application?

Any precautions regarding the application will be detailed in the technical specification that will be created for projects. However certain precautions have to be taken regarding the handling and storage of the FloWell solution and these are detailed below.

1. FloWell must not be allowed to freeze as this causes the active components to crystallise and because a special process is required to remix the solution correctly (which cannot be done in the field) then extreme care must be taken during the storage and usage of the inventory.

2. Because FloWell is a controlled and balanced solution it cannot be diluted except for certain applications (cleaning of produced water to remove oil contamination). This also requires careful control to avoid loss of water content from evaporation. When used in hot climates, if the container is not kept closed then evaporation of the water content can occur, leading to a concentration of the solution. This can lead to excessive dosing with reduced distribution, causing complications during the application. It is therefore recommended that protection from heat and low humidity conditions be provided.

3. As has been previously discovered that FloWell is incompatible with “others” chemicals, it is advised to ensure that there is no contamination either in the inventory or from equipment used for the application. Every piece of equipment must be thoroughly cleaned if it has been used for anything else.

4. Although FloWell is hazmat 000 rated it is advised that any precautionary measures indicated in the MSDS are followed implicitly. This will prevent simple things like skin sensitivity which is often found in certain people when handling alkaline based materials (soap liquids etc.) which is basically the classification under which the FloWell solution is in.

How soon do we get results after beginning the FloWell application?

This is a difficult one to answer because everything depends on the project. We have had instantaneous results on small projects, we have had results appearing 24 – 48 hours from beginning the project. When you consider that a pipeline application of many kilometres length can take days for the oil flow to travel its extent then results may not be known for a few days.

One thing that is certain is that when the results begin to show they are dramatic. We can usually project reasonably accurately once we have examined the project and for which we will give reasonable KPIs to enable evaluation of the project to be made.

The same applies for the extent of a project. A pipeline that has taken many years to reduce in volume will not be cleared and cleaned overnight. However, knowing its original capability, present flow rates, and flow rate increase it is possible to project reasonably accurately once the project is in progress.

Can FloWell be used in condensate streams?

FloWell has been successfully used in a condensate stream project in Kazakhstan. Not only did it solve the paraffin problem permanently it also proved through an unusual test that the FloWell maintained its properties of inhibiting reciprocation where a sample was reduced to sub-zero temperatures.

There was an amusing incident when the FloWell application began which appeared to be a concern but on analysis proved the efficacy of FloWell. The nominal content of paraffin within the oil stream was around 5%.

When the project began this content suddenly rose to over 30% astonishing the observers of the application. What was proven out is that after a period of time the paraffin content dropped back to 5% and it was discovered that the increase was due to existing precipitation that was bonded to the assets, slug-catcher and pipework, was being returned to liquid phase.

This delighted the client because when the slug-catcher was last inspected it looked as though a snowstorm had happened inside. White deposits of paraffin coated all the surfaces. An inspection using thermal imaging cameras showed that FloWell had removed all these deposits.

You claim that the FloWell provides a permanent solution can you qualify that?

We can use the word permanently with confidence and an example of how we gained this confidence is when an experiment on paraffin (of which we have a video) that had been treated with FloWell and had previously been shown to precipitate at around 50° C showed some amazing properties of FloWell. The treated condensate/paraffin was subjected to temperatures as low as -4° C and instead of becoming rigid, it showed all the properties similar to melted snow (slush).

As the test sample was returned to room temperature the sample liquefied showing no signs of losing its properties. This was a clear indicator that not only does FloWell return paraffin to liquid phase it also lowers the wax appearance temperature to unbelievable levels. This should be a clear indicator that FloWell when applied on a correctly managed application should eliminate all paraffin precipitation problems.

Can FloWell be used on any API grade of crude oil?

It should be appreciated that the FloWell Solution dosage rate is not determined by the API grade of the oil, but rather by the quantity of paraffin in the oil and the wax appearance temperature.

The advantage using it in a light oil application is that the FloWell solution will rapidly migrate through the flow meeting the paraffin much more quickly and begin its work well before the oil temperature drops.

However, as we have stated before, the most appropriate place for the application of FloWell is in the oilwell itself. This is because the temperature is at the highest and the viscosity at the lowest enabling the FloWell solution to rapidly migrate.

It is only when we begin analysis of the project application data that we can correctly evaluate the amount of PPM required. It will then be adjusted according to the conditions. It is a performance data managed calculation for which our technical team has sufficient experience to manage these kinds of projects successfully.

We would like to test FloWell in the laboratory before use, is this a problem?

The problem with laboratory testing is that it is impossible to simulate the exact conditions that are found in oil streams especially down the well. This is not to say that FloWell cannot produce excellent results in the laboratory. Recent tests in an Indian laboratory returned results in excess of 95% which they were absolutely delighted with.

Some of the tests have returned negative results. More often than not the oil being tested is dead, completely de-gassed and de-watered, plus it had already been subjected to other chemical additives used at the wellhead to assist with flow.

Principally one of these is DRA (drag reducing agents) with which FloWell is not compatible. The statement about being unable to simulate true working conditions is supported in a paper by an eminent research scientist who works for a major international oil company as follows;

("Wax inhibitors are sometimes used to reduce the rate of wax deposition in pipelines. The efficiency of the inhibitors depends on several factors such as the right chemistry, injection or introduction at the correct location, targeting the right operating conditions and testing appropriately. It is known that bench top tests such as cold finger tests, while useful to qualitatively gauge chemical performance, are not useful to quantitatively predict the performance of a chemical under field operating conditions. This is because the operating parameters such as the temperature difference, heat flux, and shear rates experienced in the field cannot be reproduced in such bench top devices simultaneously")

He placed great emphasis on this fact. We would however like to point out that in all the practical applications that we have done up-to-date in the oil and gas industry have been met with success. Not a single application failure has been recorded.