2024 GAS LIFT WORKSHOP

Production Stabilization in Wells with Downward Inclined Flowlines Through Seafloor Gas Lift

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Agenda

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- SIMULATIONS PREMISSES
- CASE STUDY
- CRITICAL FLOW THROUGH THE RISER BASE GAS LIFT CHOKE
- CONCLUSIONS

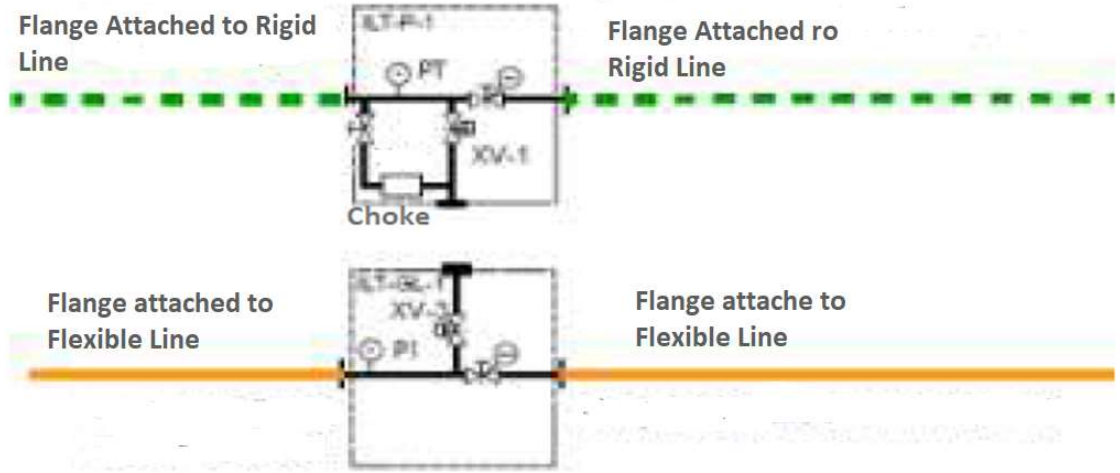
Introduction

In a scenario, where the the flowlines need to have a long tie back and a very downward bathimetry from the XMas to TDP, there might occur some flow assurence issues that should be addressed, like the difficulty in dissociating an hydrate plug.

This kind of geometry also brings another problems like severe slugging. Once we will need to install an equipament (HMXO) that provides a Cross Over, near the TDP for hydrate purposes, we are going to try to minimize the severe slugging issue, by addind a gas injection point in this equipament, to be able to do a Riser Base Gas Lift.

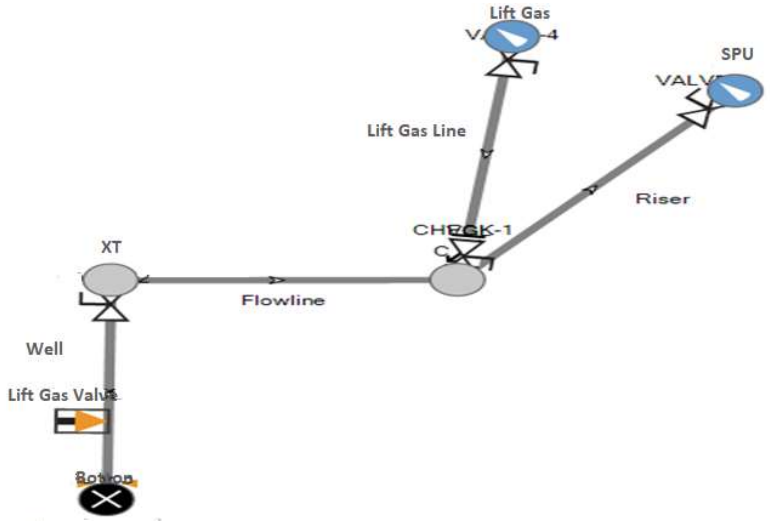
HMXO

The HMXO will allow the conection between the gas lift line and the production line near the Riser Base. The equipment will also have a choke valve that will be adjustable by the plataform and will control the gas inflow near the Riser Base when needed.



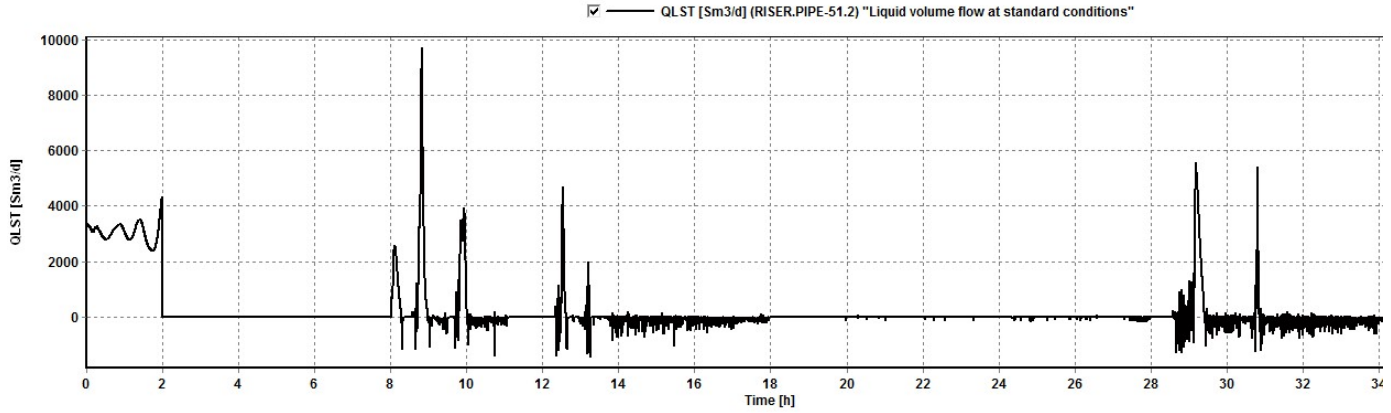
Simulations Premisses

For the simulations, it was used the software Olga 7.3.3, and the gas lift line from the plataform to the Riser Base was modeled to ensure that oscilations in the gas lift line, caused by oscilations in the production line while not at Critical Flow, were been considered.



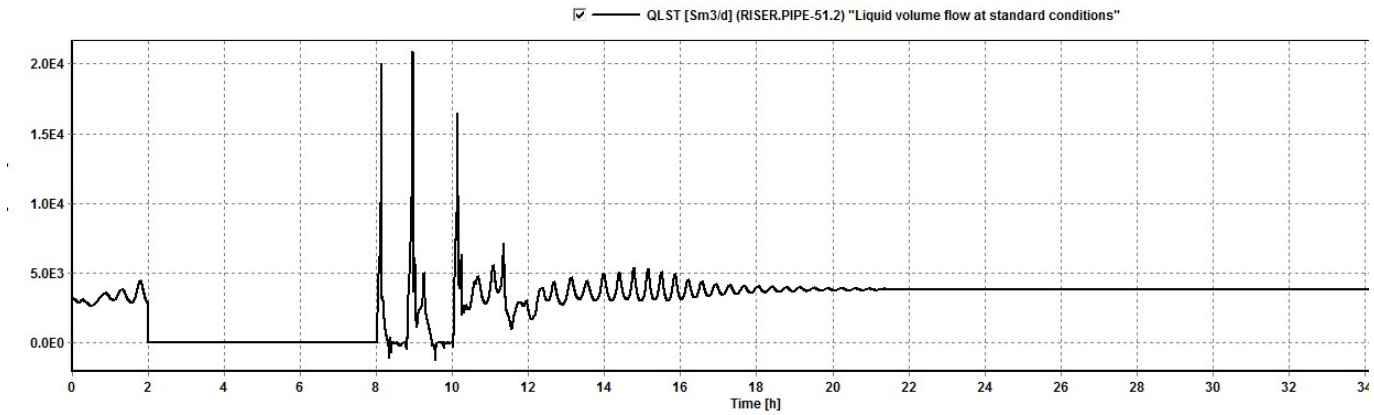
Study Case

In a scenario, where the system had a very low Reservour Pressure and high water cut (above 65%), the gas injection pressue can be so high, near the injection point, that the well can stop producing liquid, and part of the injected gas from the Gas Lift Valve can be incidentally injected into the reservoir, and another part of the injected gas would be produced. In this case, only part of the injected gas would be produced. That´s why we decided not to consider the production from this well after this period.



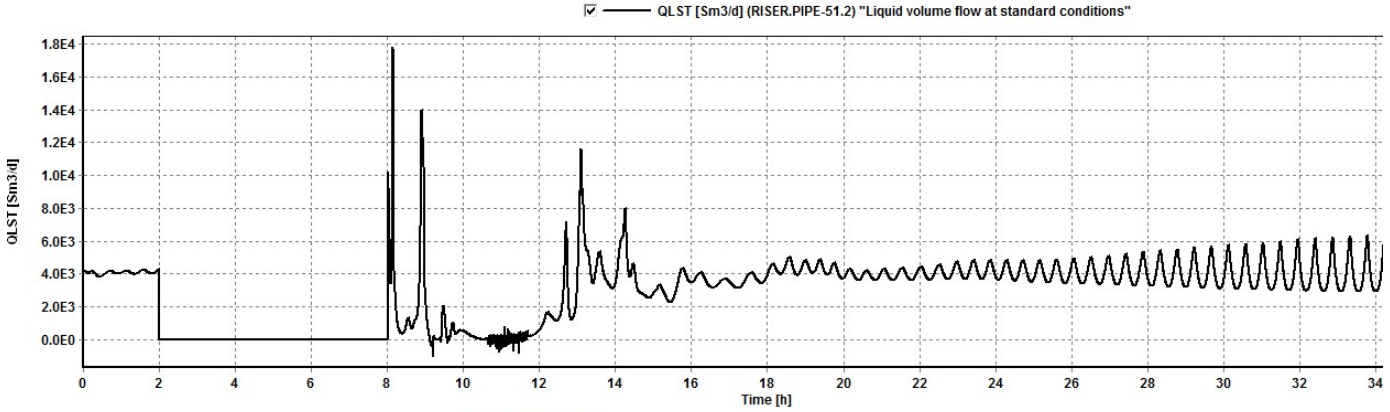
Study Case

By injecting around 500000 Sm³/d of gas from the Riser Base, the well was be able to produce again very stable, and for this reason, this well´s production could be re-estabilished, even when the Water Cut was above 65%.



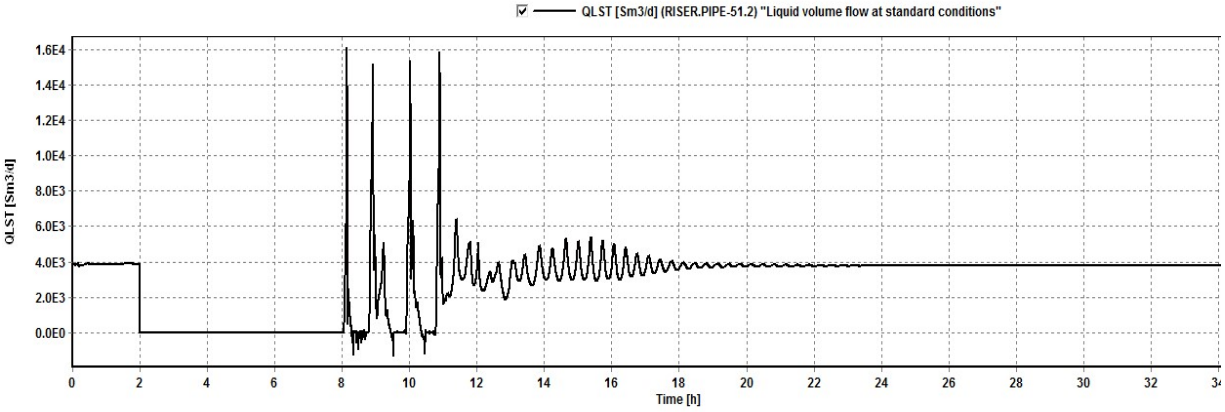
Study Case

In a lower Water Cut (around 50%) and same Reservour Pressure from the previous scenario, by injecting around 400000 Sm³/d of gas from Gas Lift Valve inside the well, the system was not able to reach stability. After a period when the gas was stabilizing the well, the injected gas flowrate was not able to make this well reach stability, and the system´s oscillations started to get higher again, that is because under these conditions, the flowrate of 400000 Sm3/d was not enough to keep the well stable.



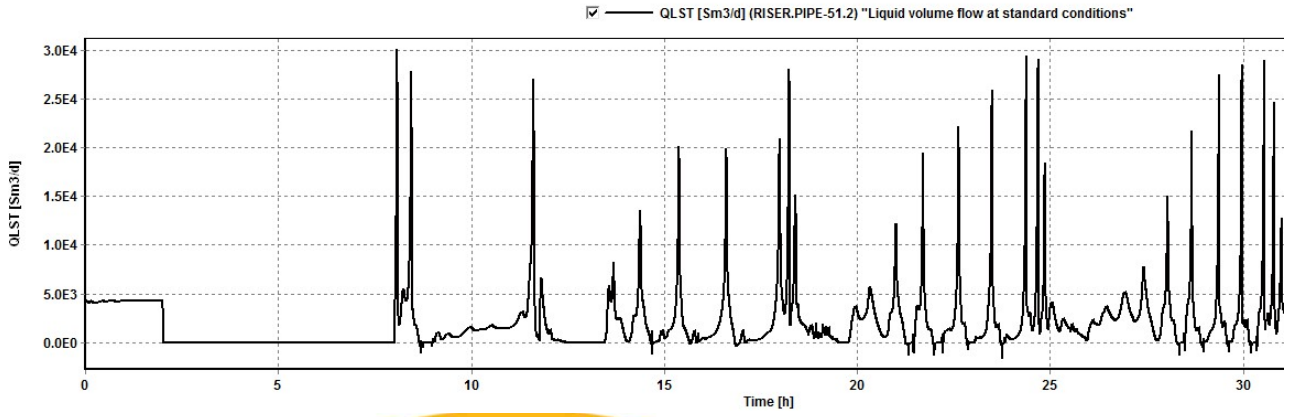
Study Case

By injecting around 400000 Sm³/d of gas from the Riser Base, the system was able to produce very stable again. Once the gas is been injected very close to the point the gas was acumulating inside the lines, it showed to be much more effective, since even only with this gas flowrate, the system was able to lower the Liquid HoldUp from that point on, and the system could reach stability.



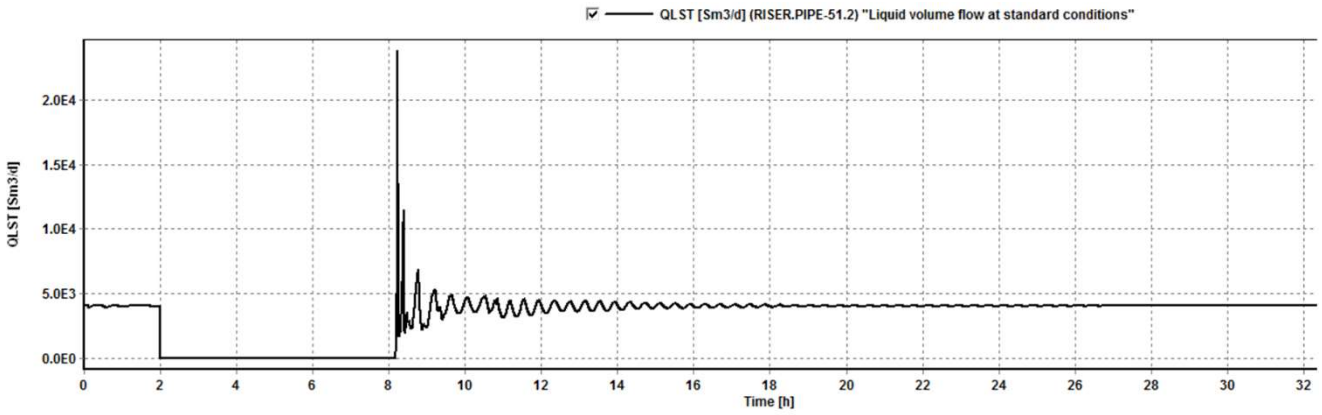
Study Case

In a scenario, where it was possible to keep the Reservour Pressure higher than in the previous cases and the Water Cut could reach around 80%, by injecting around 600000 Sm^3/d of gas from Gas Lift Valve inside the well, the system was not able to reach the stability even after 24 hours since the well was opened.



Study Case

By injecting around 600000 Sm³/d of gas, from Riser Base injection point, and keeping the same scenario described at the previous slide, the system was able to reach the stability after around the 10 hours after the well was opened.



Critical Flow Through the Riser Base Gas Lift Choke

It is very important to keep the gas flow through the choke, that will inject gas near the Rise Base, in Critical Flow. That is because next to Rise Base, there will have much higher pressures oscilations (transients) than inside the well (where the GLV is located).

The Critical Flow will reduce the oscilations and stabilize the well effectivelly. Despite having an adjustable choke, its important that the maximum size of the orifice don´t be so large to ensure the Critical Flow through the orifice, and by the other hand, the maximum size of the orifice (choke fully opened) could be able to allow the gas injection on those high gas flowrates, the system requires to stabilize the production.

It´s very important to choose the best CV for the choke to be used in the Riser Base Gas Lift Injection.

Conclusions

- The HM-XO will bring another benefit to the project, once it will be able to take advantage of the communication point between the service line and the production line, and by adding a choke valve, this equipment will be able to inject gas near the Rise Base. In this way, riser base gas lift injection will become possible, which proved to be effective in mitigating the severe slugging problem, mainly in the final part of this well´s production period. The Riser Base Gas injection point, ensured that the original production curve could be honored without intermittency lissues.

- It´s importante consider and quantify the non produced oil from severe Slugging scenarios. In the case above we decided initially not to take into account the oil production after a Water Cut reached 65%, since from this point on, the Reservour´s Pressure was so low, that we would have an intermitent production (or even no production at all) while injecting gas through the gas lift valve. The Riser Base Gas lift was able to make the well produce from that point on with more stable production, so the value the Riser Base gas lift will bring to the Project became very clear.

- It´s very important to choose the best CV for the choke that will ensure Critical Flow through the Riser Base Gas Lift choke, and at the same time, will guarantee the high gas flowrates the system requires to reach stability.

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Question Time

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