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A leader and process control consultant at MaxFlow company which works for process and control optimization projects in chemical, power, pharma and hydrocarbon industries. Has 12 years experience of optimization based on solution of controllability problems, process control redesign and APC projects.

István VAS (Co-presenter)

gázturbina és kompresszor üzemeltetési szakértő

FGSZ Zrt.

Solve Complex problems with Digital Twin Tools - Debottlenecking natural gas compressor station

The Mosonmagyaróvár custody transfer station provides 35 % of Hungary's natural gas nominal transit capacity and due to the increased demand, the throughput needs to be further increased.

The capacity increase was significantly limited by the strong mechanical vibrations generated. Modern simulation tools was used to find all the root causes of existing problems and find cost effective solutions for the throughput intensification. Today's modern high-fidelity flow and pipeline simulation software made possible to discover alternative solutions while being absolutely sure of the consequences of each modification.

First the simulations was precisely fitted with the real system and simulated the existing vibrations and turbulent flows of operation. A rigorous field inspection increased the preciseness of the model by made it possible to model deviations from the design documentation.

20+ years of gas industry experience a group of experts and consultants developed two alternative solutions to address all the issues FGSZ would like to tackle.

An additional outcome of the solution is the decreased compressor consumption and the shift in compressor characteristics by optimising the site as a whole.

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Brand new AI components for food industry

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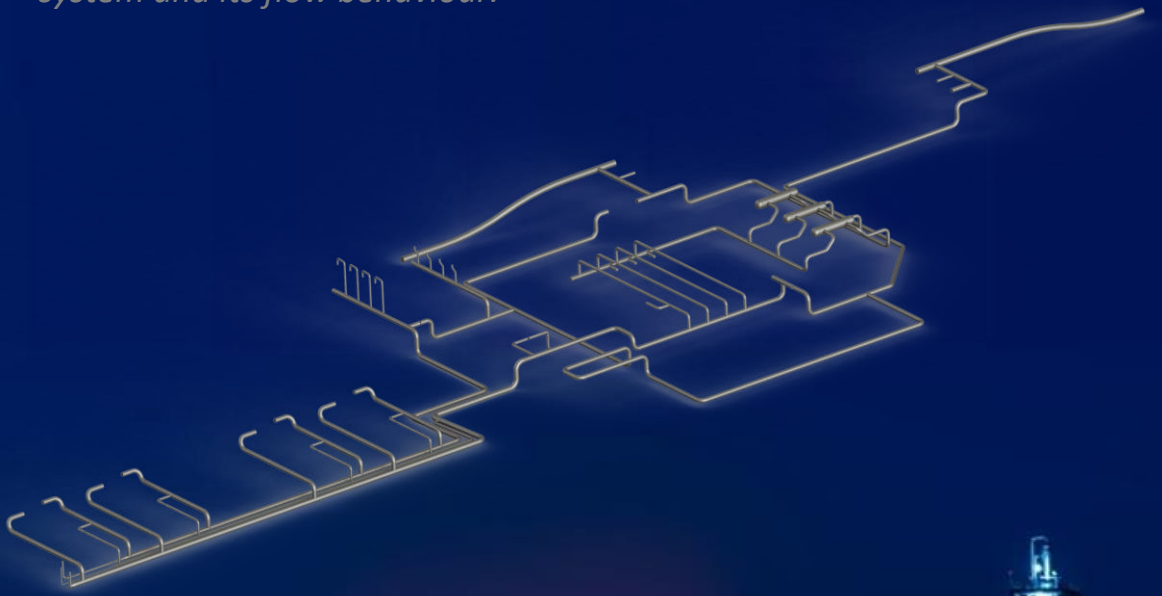
The Mosonmagyaróvár custody transfer station provides 35 % of Hungary's natural gas import nominal capacity and sometimes handles nearly 50 % percent of the import. Over the years the gas transit capacity gradually increased, and the required capacity is 50 % higher than the original design capacity. This is beyond any reasonable over-design limit.

The compressor station reached its physical capacity and the gas flow cannot be increased further due to the generated strong mechanical vibrations. It was necessary to specify the required modifications in order to further increase the capacity and eliminate the existing dangerous low frequency vibrations.
The current transport conditions do not allow the feasibility of a future transport task to be assessed. Therefore, high fidelity simulation has been carried out to determine the necessary modifications at the station to ensure a safe and reliable gas transport.

We used a set of state-of-the-art simulation tools to first simulate the current vibration behaviour and compare the simulation results with measured data. This provided validation of the accuracy and usability of the model. The model was then iteratively modified by the experts until it met the technical requirements of the FGSZ. The process resulted in two alternative solutions with different technical solutions, but with almost the same goodness of fit. A high-precision model for the entire compressor station made possible to determine the scope of modifications required in a cost-effective way without any guesswork.

An important economic aspect is the amount of fuel gas used by the gas turbines operating at the station. The extent of this depends on the pressurisation task, the amount of gas to be delivered and the hydraulic conditions (station inlet and station outlet pressure). Pressure losses within the station increase the consumption of fuel gas, so it is important to use simulation to decide on the optimisation options for the process piping system. Station optimisation also has a positive effect on compressor operation. Due to the reduction in pressure loss, the operating point is shifted to a more favourable range, which increases the compressor's operational safety and delivery capacity.

One possible solution for achieving decarbonisation targets is the use of hydrogen. Therefore, it was considered necessary to investigate the presence of hydrogen in the pipe, which is currently negligible, but is expected to become more abundant in the future, and the impact of the hydrogen-natural gas mixture on the process system and its flow behaviour.



In addition to the cases mentioned above, simulation has also a justification in other situations. Instead of the actual operation of the technology, simulation can be used to investigate the behaviour of a high-value and sensitive technology carrying an explosive medium under conditions specified by the operator.
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