Project: Optimization of Gas Transport – Part 1A

Characteristics of Compressors for Natural Gas Pipelines

Background:
TAG GmbH is the Austrian gas transmission system operator (TSO) that owns and operates the pipeline system which connects Baumgarten an der March (Slovakian border) to Arnoldstein (Italian border). The system consists of five compressor stations and three parallel pipelines (between 36” and 42” of diameter), along a route of around 360 km, and the maximum transportation capacity at the exit point of Arnoldstein is about 4.4 million normal cubic meters per hour.

Currently there are 16 gas turbines of nominal ISO power of 23 MW (GE PGT 25) and 10 gas turbines of nominal ISO power of 10 MW (NP Frame 3), corresponding to a current total installed power of ca. 430 MW. In the next year, TAG GmbH will replace 7 old Frame 3 units with 4 electric driven units, in order to decrease the emissions (CO and NOx) and to increase the flexibility of the system. Additionally, TAG GmbH owns and operates a waste heat recovery unit (WHRU) in one of its stations, producing and selling electricity to the local distributor.

TAG GmbH has implemented a new simulation software, including online simulation, steady state simulation and dynamic simulation. The software, called SIMONE, is one of the most common commercial simulation software for gas transmission systems in Europe.
**Project overview:**

The project aims to evaluate the gas-compressor characteristics of all PGT25 driven units installed. These are major input parameters for the SIMONE based pipeline simulation of TAG.

**Gas-compressor characteristics**

A centrifugal compressor is characterized by two sets of characteristics curves which are plotted using an **adiabatic head/volumetric flow rate** co-ordinate system. The first set of curves is parametrized by revolutions, the second one by efficiency. The curves are defined by providing the intersections of some of these curves as well as the limits of the possible working area.

The valid area for the compressor working point is limited to the left by the **surge line**, on the lower and upper end by **minimum and maximum revolutions** respectively and to the right by the **choke line**.

To evaluate all these data, there are three possibilities:

- Using available historical data (granularity: 1h)
- Performance tests directly on sites
- Combination of performance tests and using available historical data
**Involved parties:**

- TAG GmbH – System Management
- TU Wien – Institute for Energy Systems and Thermodynamics

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**Scope of work:**

This project could be considered as a diploma thesis.

As a final deliverable, TAG expects to get the following information:

- All compressor maps in table form (as expected for SIMONE) and in graphical form
- Calculation methods
- Description of all used metering devices and their accuracy

Additionally, TAG expects all input tables for SIMONE in digital form (MS Excel…).

All documents shall be written in English.

TAG expects a total duration of this project of around 6 months.

**Project start:** April 9th, 2018

**Project end:** October 9th, 2018