Energy-SmartOps
Integrated Control and Operation of Process, Rotating Machinery and Electrical Equipment

Model-based Condition Monitoring Of Industrial Operated Centrifugal Compressors For Process Industry Applications
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Project aim
Development of physics-model-based methods for on-line performance and gas path components condition monitoring with focus on slow dynamic mechanisms of performance degradation.

Constitutive equations:
- Mass and energy balances
- Velocity triangles at inlet and outlet of the impeller
- Equations of state
- Loss correlations

Problem statement
The gas path geometries are slowly modified by deteriorating external agents, and both the degree of modifications and a quantification of their impact on performance drops is unknown.

Monitoring methodology
- Performance parameters
- Performance deviations
- Non-controllable operating parameters
- Un-known geometrical parameters representing the modifications caused by external deteriorating agents
- Measurements noise
- Vector valued nonlinear continuous function (i.e. the physical or data-driven model)

Model calibration and validation
- Development of systematic approach to loss correlations selection.
- Implementation of data pre-processing techniques.
- Development and implementation of monitoring method.
- Proof of numerical stability for the developed algorithm.
- Experimental investigation of fouling and humidity effects on performances.