# The challenge to introduce a KPI for valve reliability to be used in projects with Valve Manufacturers, EPCs and End-Users

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# A KPI for Valve Reliability?

- Why do we need a KPI?
- What is a KPI for Valve Reliability?
- How to apply a KPI in projects?
- What are the challenges
  - practically applying a KPI?
  - using it in projects with multiple parties?
- What is the benefit / cost ratio?

# Why do we need a KPI?

- Are you a valve nerd?

  Some, maybe most of us will answer “For sure not”
- So what’s the answer to the following question:

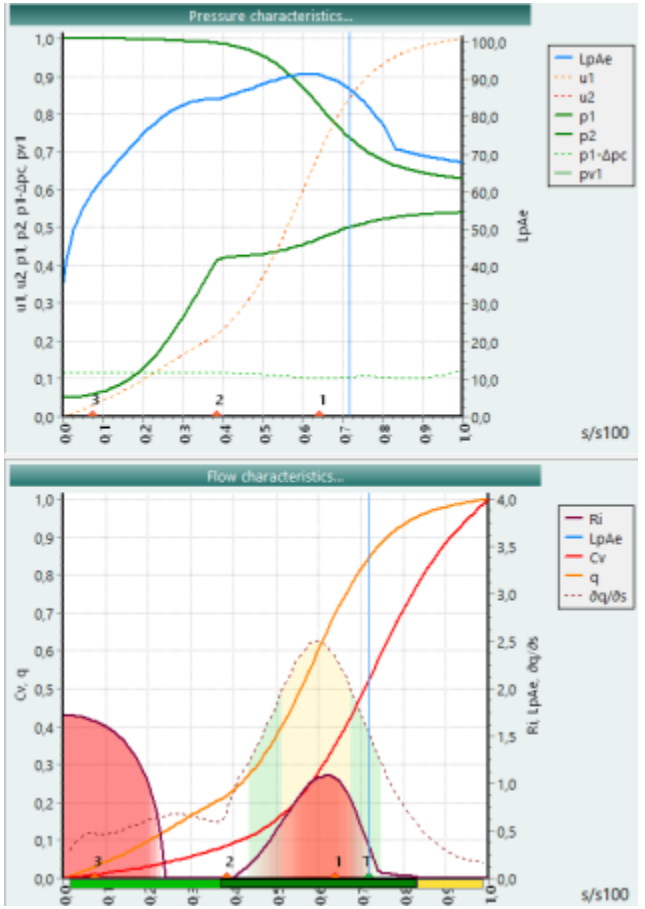
  “How can I reproducible decide if a valve matches the given process conditions so that it performs reliable in any mode of operation?”
  - Gut instinct?
  - Rules of thumb?
  - Applying best practices?
  - …

# Why do we need a KPI?

- To ensure that independent from the individual doing the analysis the given rating is reproducible identical
- To allow analysing valve cases by “non-nerds” having “only” the process conditions
- To quickly detect the severe cases out of a big population of cases
- To be able to predict the impact of changing process conditions
- …

# Why do we need a KPI?

- To review the full range of operating conditions: (Min, Norm, Max, Start-up, … 0% to 100% of valve opening)
- To ensure that you don't miss something



# Quick definition of the KPI

- A KPI called **R**eliability **i**ndex "**Ri**"
- A single number for each operating / process condition
- The range of the value is defined
  - 0 to 0.1 No reliability problems expected
  - 0.1 to 0.5 Possible reliability problems
  - 0.5 to 1 Limited reliability
  - >1 Possible mechanical damage
- Additional information about the root cause when "Ri" > 0
- Hints to improve reliability when "Ri" > 0

# Deriving of the KPI

- To calculate the KPI, all major reliability influencing factors need to be taken into account.
- General parameters like
  - Δp
  - Energy conversion
  - Noise level
  - Outlet flow velocity
  - Valve type
- Flow conditions
  - Cavitation
  - Flashing
  - Choked flow
- Fluid properties
- Process conditions
  - Normal operation
  - Start-up
  - Special operation
- …

# How to apply a KPI in projects?

- Determine the KPI with final operating conditions

  for all modes of operation
- Follow the hints, discuss and select more suitable solutions
- Ensure that finally no valve will be selected with a KPI > 0.1

- Sounds easy, isn't it?

# Challenges applying the KPI

**Process data / specification**

- Data transfer in paper or PDF format
  - Data quality aspect (typos)
  - Processing speed
- Data not complete
- Data not correct
- Data changing last minute
- Data not covering all modes of operation (e.g. Start-up)

**Used calculation methods**

Example noise prediction

- Noise level for KPI
  - latest standards for liquid, gas and steam
- Noise level from vendor
  - Proprietary
  - maybe not latest standard

# Challenges applying the KPI

**Best practice versus KPI rules**

Example outlet velocity

- KPI
  - Velocity in outlet flange
  - Gas and steam up to 0.3 Mach
- Vendor or EPC
  - Velocity in the outlet pipe
  - Gas and steam up to 0.5 Mach

**Vendor data**

Missing valve data

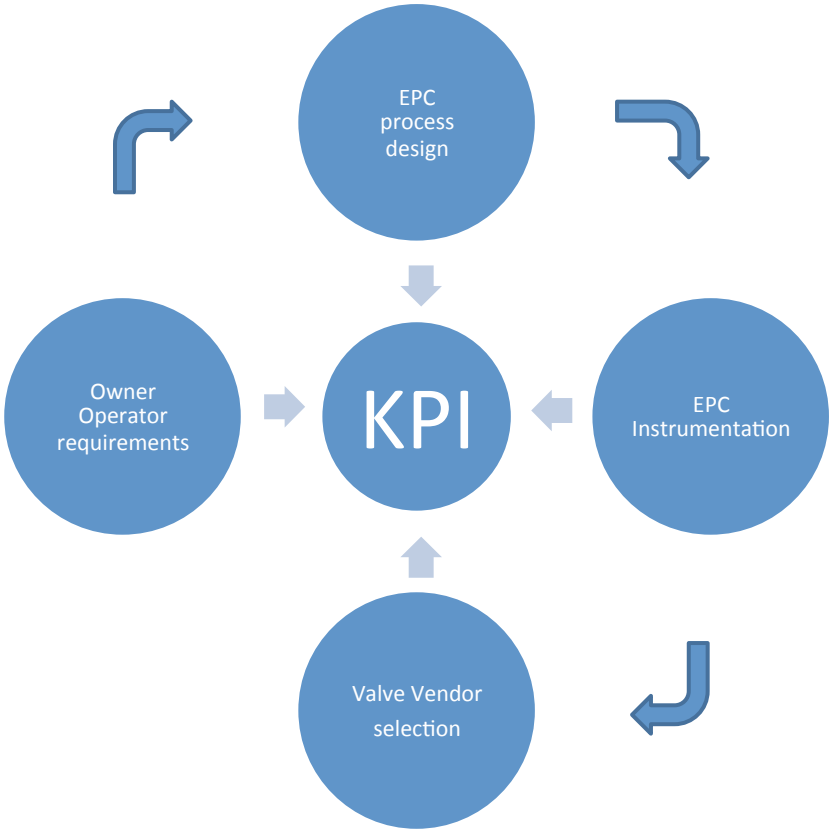
- xFz for noise and cavitation prediction
- $FL^2$ choked flow liquid
- XT choked flow gas & vapour
- …

# Special challenges in projects

## Communication

- The biggest challenge at all
- 3+ parties involved
- Project workflow is not yet designed to use a KPI as a central quality control element
- There is no common data language for cycling specification and selection data
- No common practice established yet

## Collaboration



# Does that all make sense?

- What is the benefit cost ratio?
- A BCR of 30 to 100 is realistic!
- Verified in a pilot project
- Confirmed by recalculating past projects

# Questions & Discussion