



HYDROCARBON PROCESSING®

# IRPC

October 2-3, 2024 | DoubleTree by Hilton, Greenway Plaza, Houston, TX

# AI for valve predictive maintenance

Reducing Industrial Risk and Total Cost of Ownership

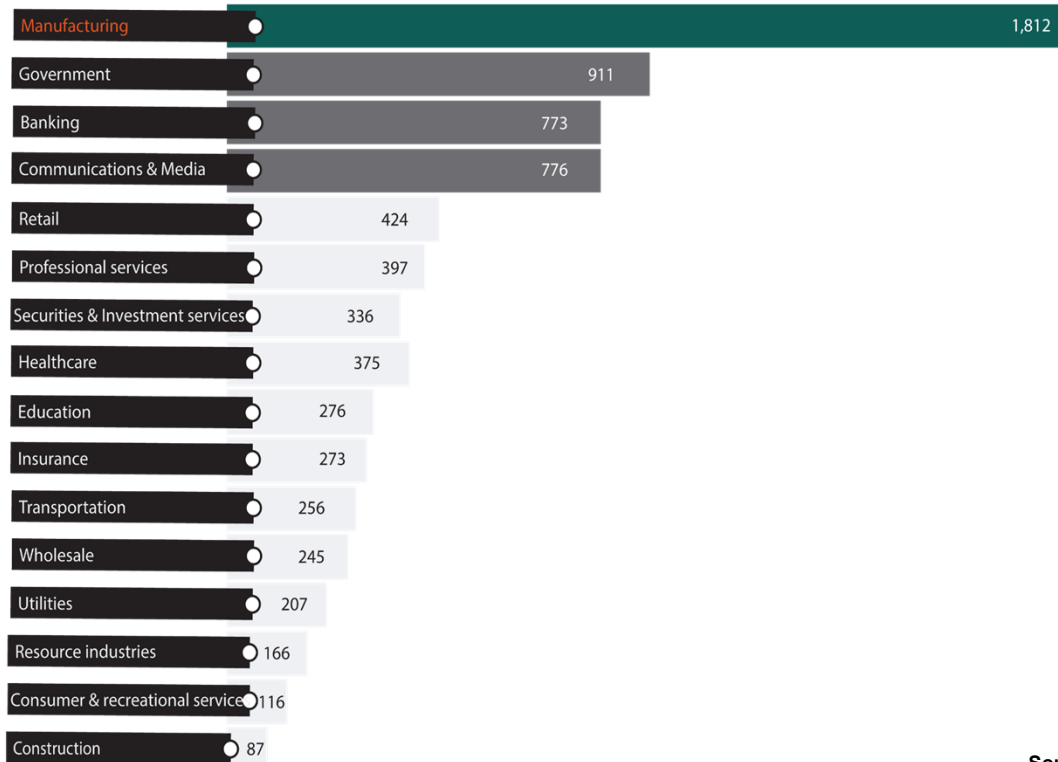


Jay Hunt

NA Industry Manager, Refining and Chemical  
Global BDM Licensor Technology



# Manufacturing already generates more data than any other sector\*



Measurement in Petabytes  
1 Discrete manufacturing  
constitutes 1072  
petabytes; process  
manufacturing 740  
petabytes

Source: IDC; McKinsey Global Institute analysis 2010



## A typical process plant analysis

- **30% of controls in manual**
- **20-40% of controllers oscillating**
- **30% of valves with mechanical problems**
- **Control system is delivering sub-standard results**
- **Potential to improve control and reduce variability by 50% or more**



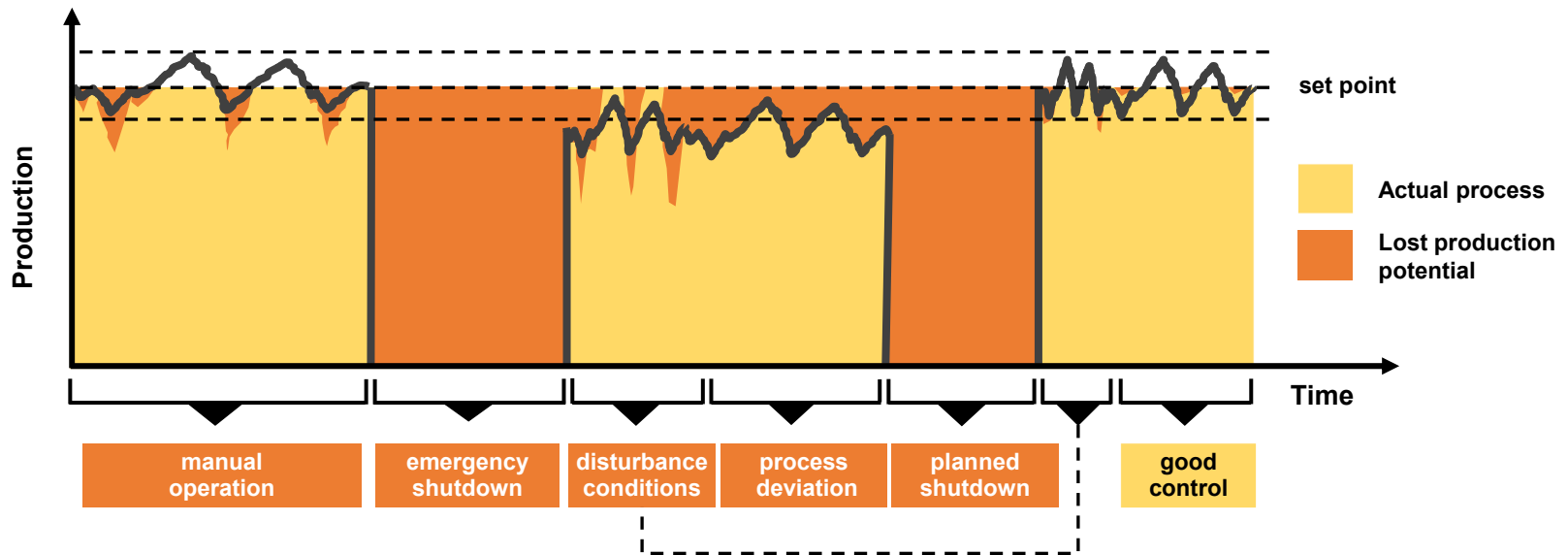
**Chemical savings**

**Production increase**

**Quality improvement**

**Reduced energy costs**

# Sources of lost production



# Three key levers to process improvement

## 1. Stabilize

Reduce process variability



## 2. Optimize

Increase production rate



## 3. Maximize

Asset availability & uptime



# But what about the past setup of hardware & software tools and people in industry?

## Hardware & Software tools

- Focus on **control**
- Flood of **monitoring data w/o classification**
- **Small number of smart devices**
- Black boxes
- Heavy maintenance **data historians**

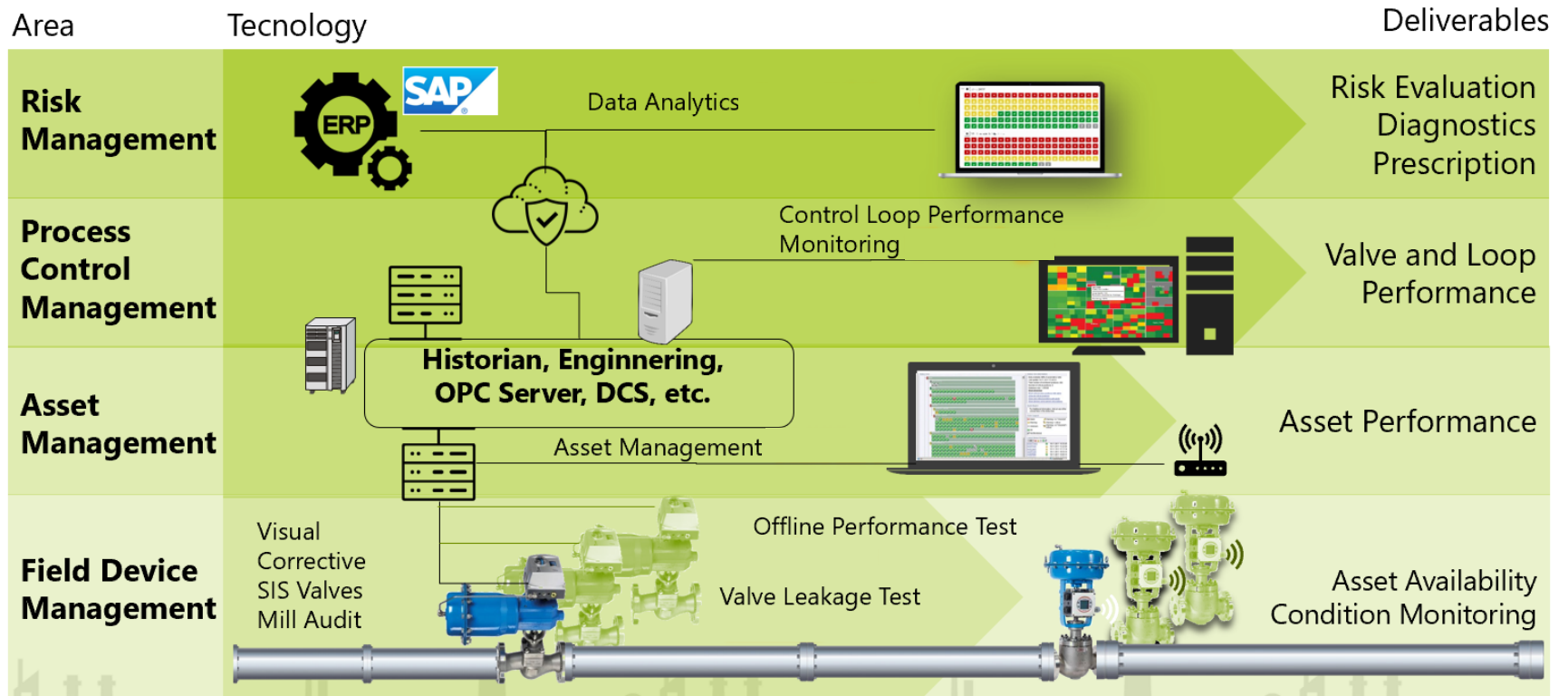
## People

- Few **dedicated** people
- **Many device vendors** to handle
- **No predictive** maintenance mindset
- **Lack of local skills** and training



# IIoT condition monitoring tools in all levels

Connected to the vendor expertise

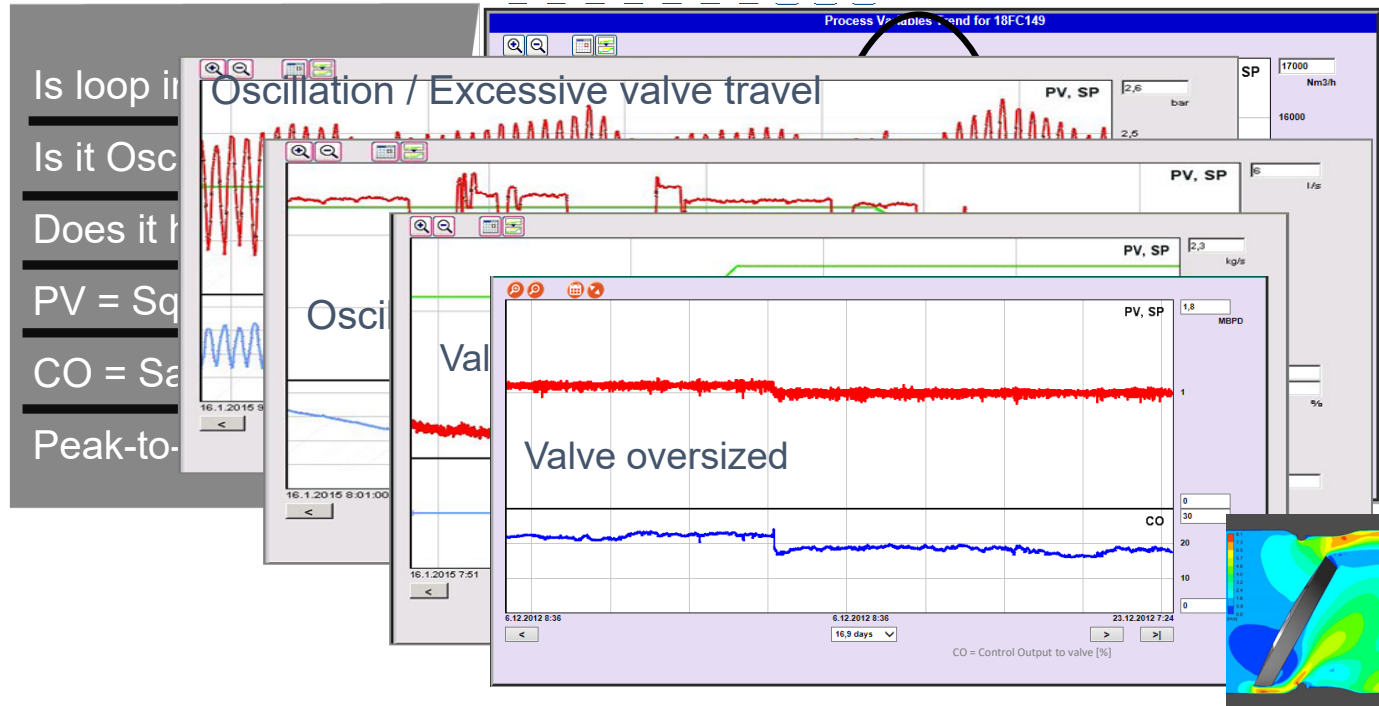




# Diagnostics

Real examples

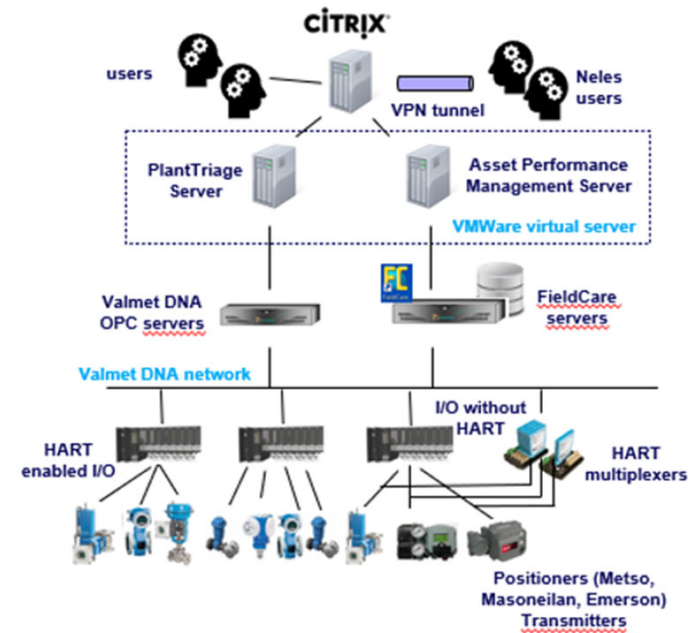
## Measuring valve friction



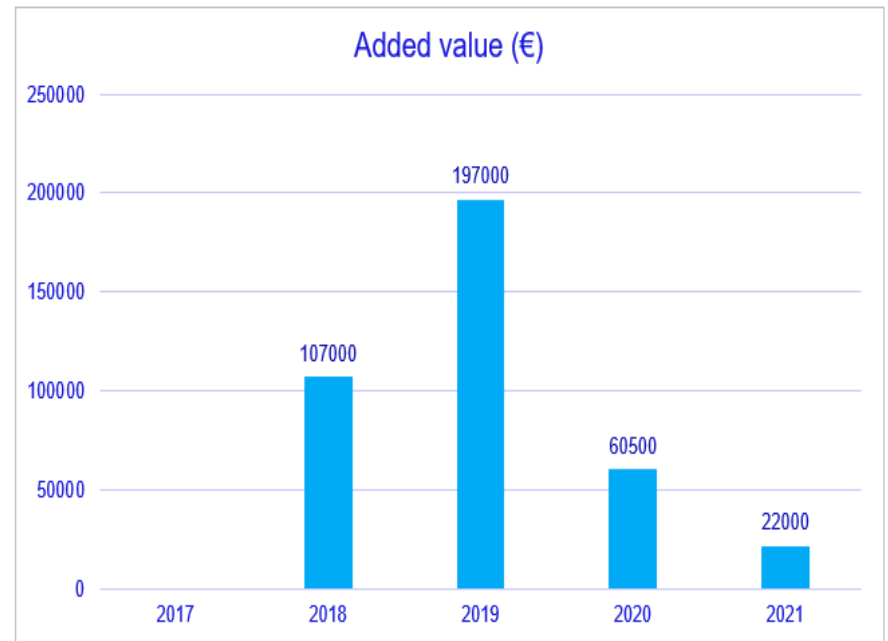
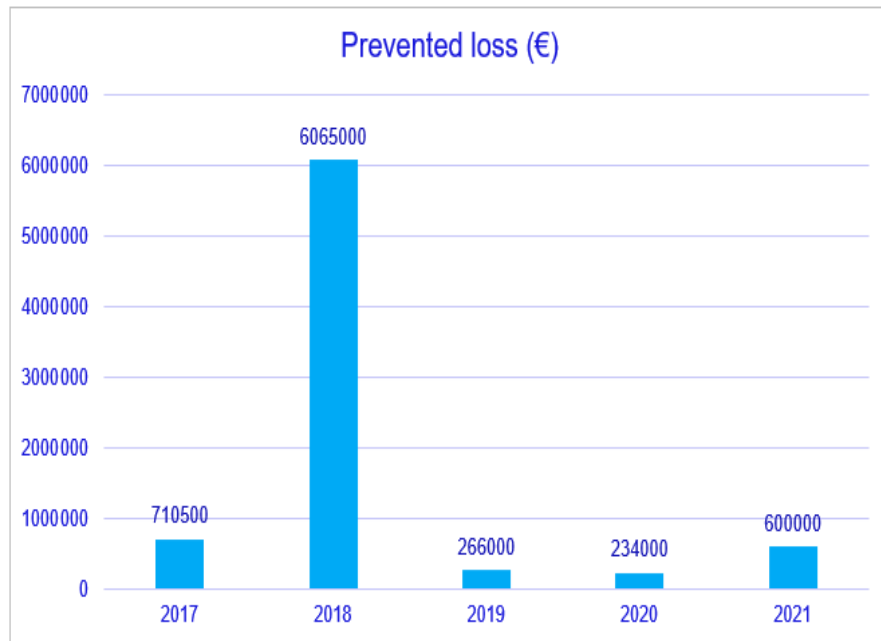
# Real case – Refinery in Nordic country

## Valmet valve and control performance monitoring service

- **What we do at customer site**
  - Valmet monitors and analyzes valve condition and process performance data.
  - Valmet informs customer of poorly-behaving and underperforming processes and equipment – upsets, bottlenecks, suboptimal operation/capacity/quality, opportunities for energy savings, safety, and environmental risks – in order to proactively address maintenance needs and implement improvements.
- **Scope:** 5500 field devices and 800 control loops (multiple brands).
  - Has contributed to customer's maintenance strategy increasingly shifting from calendar-based to predictive.
- **Measured benefits**
  - Realized savings and operational benefits are tracked. Next slide shows prevented loss and added value
  - 3-year agreement has now been renewed.



# Real case - Refinery in Nordic country



# How AI is giving a solution in 3 steps

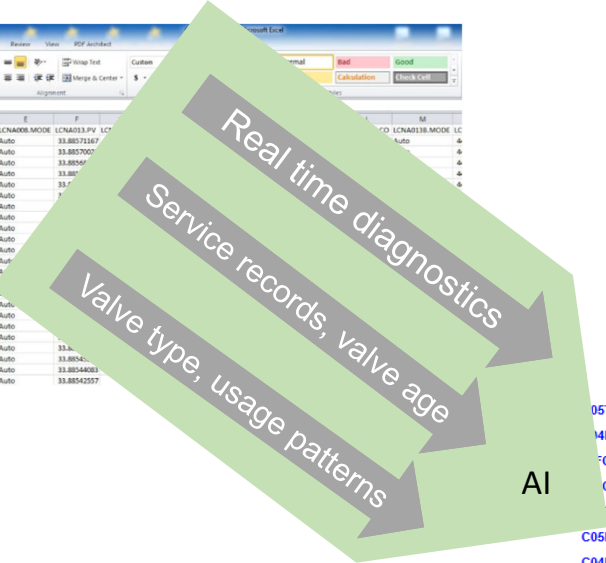
Joint work with vendor to collect data, turn to information and AI- based recommended actions



# Data to AI-based Information

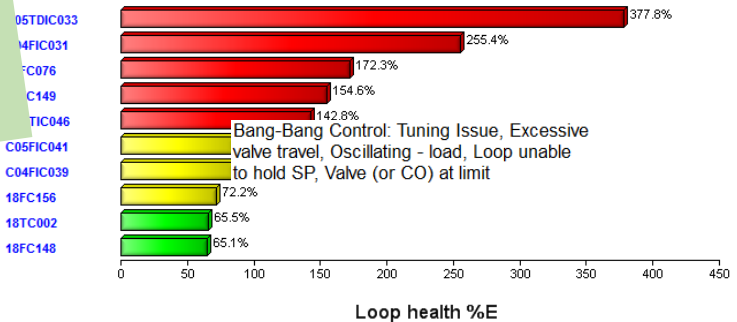
## DATA

Time	LCN	SP	CO	MODE
8/14/10 13:00:00	18.2990225	30	7	Auto
8/14/10 13:00:03	18.3050816	30	7	Auto
8/14/10 13:00:06	18.3095181	30	7	Auto
8/14/10 13:00:09	18.3099947	30	7	Auto
8/14/10 13:00:12	18.3281985	30	7	Auto
8/14/10 13:00:15	18.3513956	30	7	Auto
8/14/10 13:00:18	18.37460136	30	7	Auto
8/14/10 13:00:21	18.3978087	30	7	Auto
8/14/10 13:00:24	18.42101289	30	7	Auto
8/14/10 13:00:27	18.4361098	30	7	Auto
8/14/10 13:00:30	18.44909668	30	7	Auto
8/14/10 13:00:33	18.46208638	30	7	Auto
8/14/10 13:00:36	18.47461908	30	7	Auto
8/14/10 13:00:39	18.48740578	30	7	Auto
8/14/10 13:00:42	18.50011548	30	7	Auto
8/14/10 13:00:45	18.51284518	30	7	Auto
8/14/10 13:00:48	18.52571487	30	7	Auto
8/14/10 13:00:51	18.53178787	30	7	Auto
8/14/10 13:00:54	18.52604896	30	7	Auto
8/14/10 13:00:57	18.52102099	30	7	Auto
8/14/10 13:01:00	18.51591919	30	7	Auto
8/14/10 13:01:03	18.5109144	30	7	Auto
8/14/10 13:01:06	18.50591215	30	7	Auto



## INFORMATION

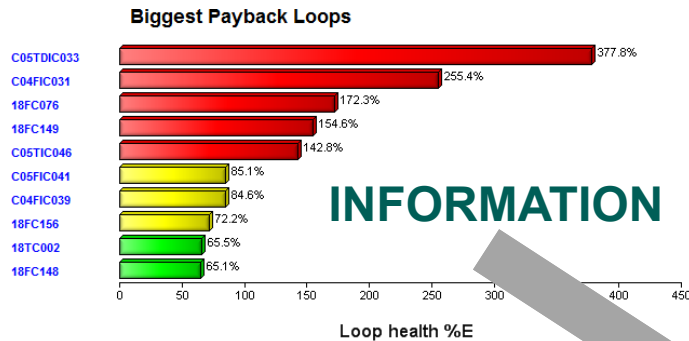
### Biggest Payback Loops



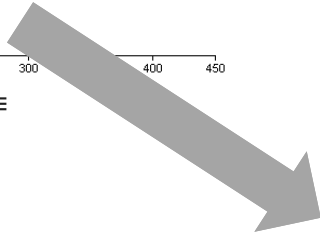
Bang-Bang Control: Tuning Issue, Excessive valve travel, Oscillating - load, Loop unable to hold SP, Valve (or CO) at limit

# Information to AI-based Recommended Actions

## INFORMATION



## INFORMATION



## ACTION



AI

- ✓ Repair?
  - What parts, resources, service guide
- ✓ Replace?
  - What model, service guide
- ✓ Monitor?
  - What parameters, Frequency

# Back to our key levers to process improvement

## 1. Stabilize

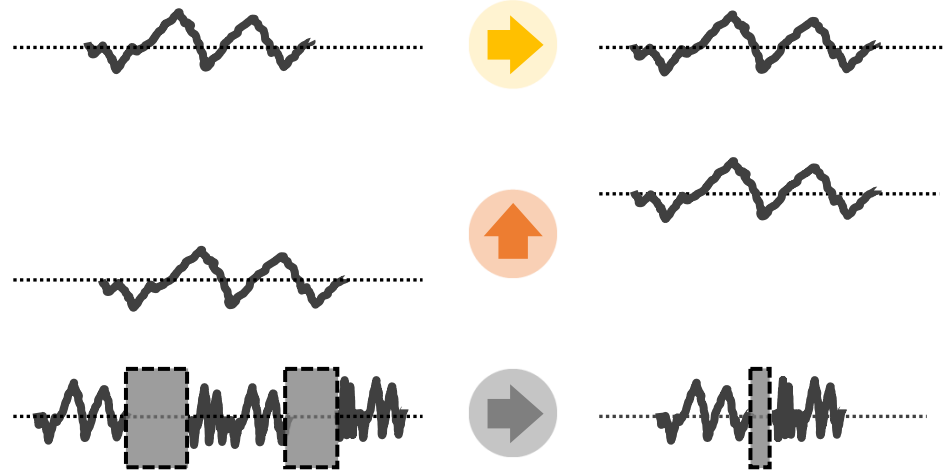
Reduce process variability

## 2. Optimize

Increase production rate

## 3. Maximize

Asset availability & uptime





# Getting started

What you **don't** need.

100% Smart Instruments

Full Sensor Network

Infrastructure

Gateways

Parallel Networks

Tons of IT Knowledge

Common Architecture

Staffing

Million-dollar budget

Massive engineering study

# Getting started

What you **do** need.

Some justification – A goal

Some connectivity

Historian

OPC

Field device protocols

Small amount of IT Support

Training

Right software tools

Tracking and follow-up

# What it does

## AI-Powered Valve Predictive Maintenance

- **Real-Time Data & Diagnostics**

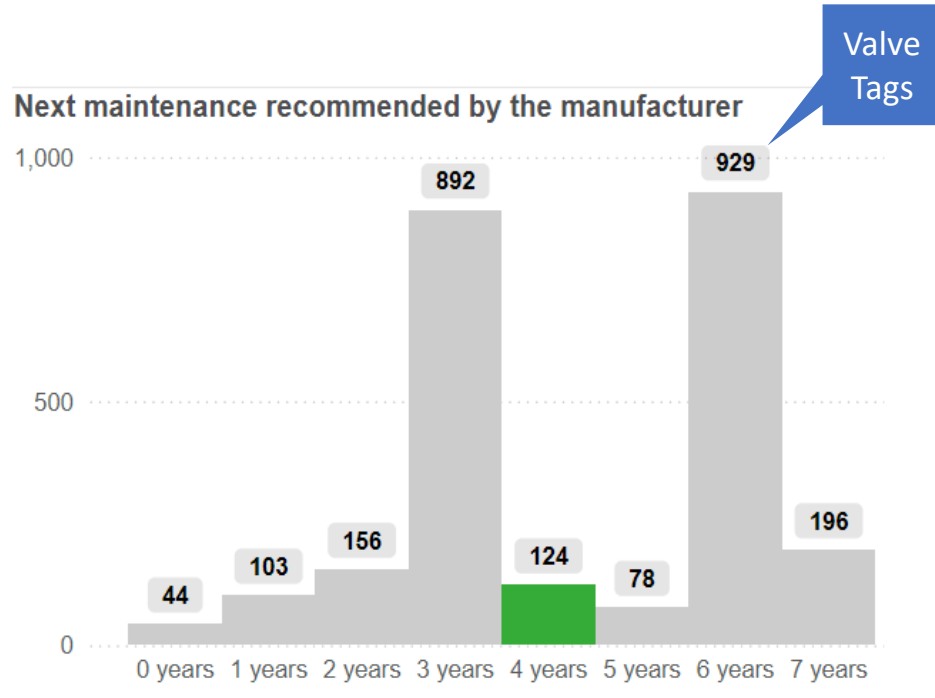
- AI processes real-time sensor data and historical service records to assess valve condition and detect potential issues early.

- **2. Predictive Modeling**

- Using factors like valve age, usage patterns, and environmental conditions, AI predicts Mean Residual Life (MRL) and calculates the probability of failure, guiding maintenance timing

- **3. Optimized Maintenance Actions**

- AI provides specific maintenance recommendations—whether to service, replace, or monitor—ensuring efficient scheduling and minimizing unplanned downtime.



# One place for valve performance and installed base data

Home ^ My equipment ^ Purchases ^ Service agreements ^ Learning ^ Projects My process performance

Summary Installed Base

Summary

Maintenance Life cycle Your database

Maintenance

Maintenance recommendations by technicians

Total: 12

As soon as possible: - In 1 year: - Next service: -

In 4 to 6 years: - Next shutdown: 12

Next maintenance recommended by the manufacturer

Year	Count
0 years	2
1 years	1
2 years	2
3 years	213
4 years	21
5 years	497
6 years	271
7 years	750
8 years	95

My Cases Discussion groups

Send us a case

You can also report a fault or enroll in a training here

Status: Show All Cases

38 In progress 1 Waiting for reply 1081 Completed

Search for cases

Filters (0)

Subject	Type	Priority
FQ 2121	Quote	High
FQ 2121	Quote	High
HOLDER	Quote	High
Knife ho	Quote	Low

Valmet

Home ^ My equipment ^ Purchases ^ Service agreements ^ Learning

Installed base

Total 1 valves

See details for -LV-012A

Tag name	Recommendations	Risk Level	Criticality	Data Verified Date	Next recommended service (years)
HV-039	Low Risk	-	31.8.2007	5 years	
HV-056	Low Risk	-	7.8.2007	5 years	
HV-143	Low Risk	-	Not verified	6 years	
HV-146	Low Risk	-	Not verified	3 years	
LIG-009B	Low Risk	-	Not verified	5 years	
LV-012A	Medium Risk	-	20.8.2007	5 years	
LV-019B	Low Risk	-	Not verified	2 years	
LV-075	Low Risk	-	29.10.2014	6 years	
PIQ-002	Low Risk	-	Not verified	6 years	
PV-001	Medium Risk	-	28.6.2007	5 years	
FFC-221A	Low Risk	-	Not verified	2 years	

Good news!

You  
already  
have  
the  
data!

# Thank you Questions?



## Flow Control & Automation Systems

- Valves and pumps
- Valve controls and actuators
- Distributed Control Systems (DCS)
- Quality Management Systems (QMS)
- Analyzers and measurements
- Industrial applications
- Services and Industrial Internet solutions



Neles™ Jamesbury™ Flowrox™ Stonel™ Valvcon™