

## SmartMachine

# Artificial Intelligence applied to rotating machines

Maximize Efficiency.

Reduce Energy Consumption.

Enhance Uptime and Lifetime.

These are the goals of SmartMachine, the advanced process controller designed to improve the operation of rotating machines by providing a set of advanced control and monitoring functions.

### Main Features

- Performance monitoring, which identifies the machine performance via process measurement and detects significant changes in the performance.
- Adaptive load sharing control by real-time optimization: the load is distributed on the machines in order to have the desired throughput but lower energy consumption
- Emissions reduction and lifetime enhancement by machine operation at peak efficiency points
- Operator's decision support, the controller suggests to the operator which machine is the best to start-up or switch-off.

### Applications

- Single critical machines:
  - Centrifugal, axial and reciprocating compressors
  - Single and multistage centrifugal pumps
  - Expanders and power recovery turbines
  - Gas and steam turbines
  - Combustion engines
- Group of machines, such as:
  - Compression and pumping stations
  - Simple cycle and combined cycle power plants

### Improvement

The performance improvement depends on the plant and machines type

- In a gas compression station the average fuel consumption can be reduced up to 5%
- In a pumping station, the average power consumption can be reduced up to 10%.



# Achieve the BEBOP (Best Efficiency and Best Operating Point)



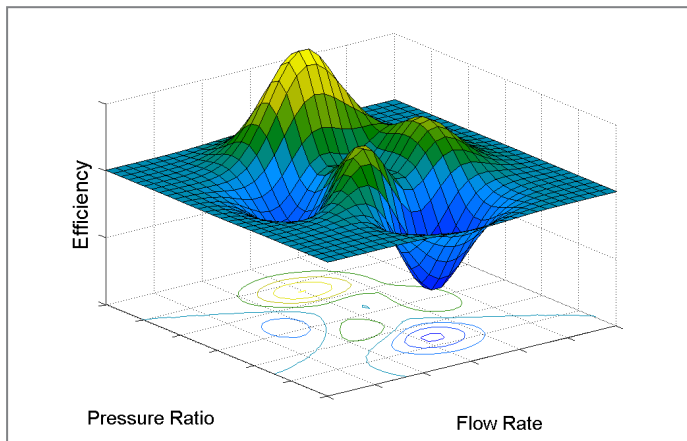
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## Energy optimization - SmartSharing

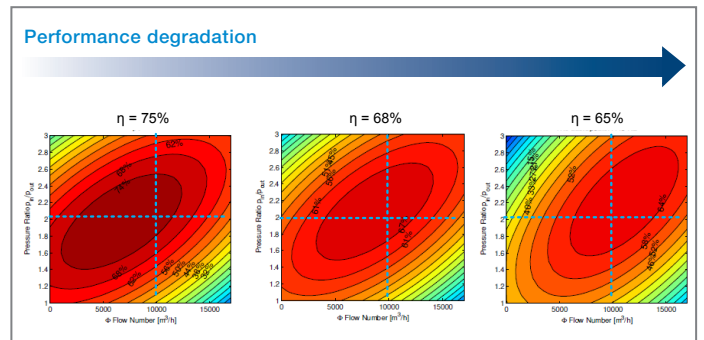
The technology named SmartSharing, uses the process measurements to automatically evaluate the current performance of each machine and define the best load repartition. The optimization is performed in real-time in order to adapt to any change in operating or environmental conditions. The operator can select which kind of optimization to perform, based on energy consumption, efficiency, operating hours or on a custom criteria.

## Performance monitoring

The advanced monitoring technology inside SmartMachine tracks the performance of each machine and warns when a potentially dangerous change in machine performance is anticipating a severe damage to the equipment. The technology is applicable to any rotating machine and can provide a separate monitoring of the driver and driven apparatus.



Energy consumption minimization



Tracking of compressor efficiency degradation

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