

Diagnostics for Reciprocating Compressors in Refineries

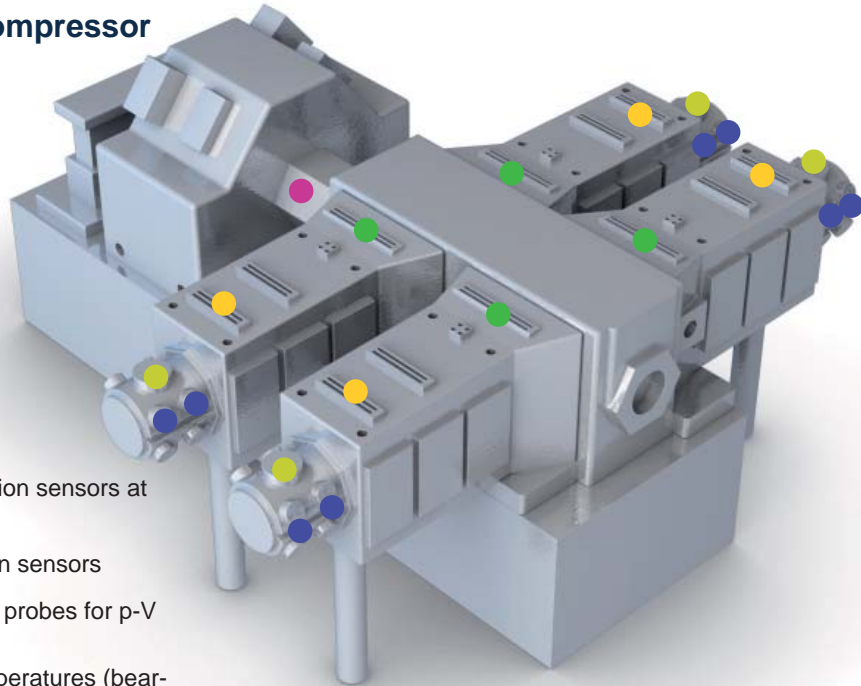
PROGNOST[®]-NT for Refining

Intelligence on Duty

The path to successful products and services is always by way of intensive dialogue with potential buyers and customers. Only by exchanging experience on a continuous basis is it possible to gain the necessary knowledge of operator requirements which fuels the development to useful products. PROGNOST Systems defines "Intelligence on Duty" using this philosophy: through the continuous integration of new requirements and practical experiences, state of the art technology is always available to users. This permanent development process leads to products and services providing exceptional benefits to our customers. The consistent adoption of this philosophy ensures that PROGNOST products and services will continue to meet the ever increasing expectations of our customers in the future.

Typical PROGNOST®-NT Sensor Positions

Example:
4-throw process compressor

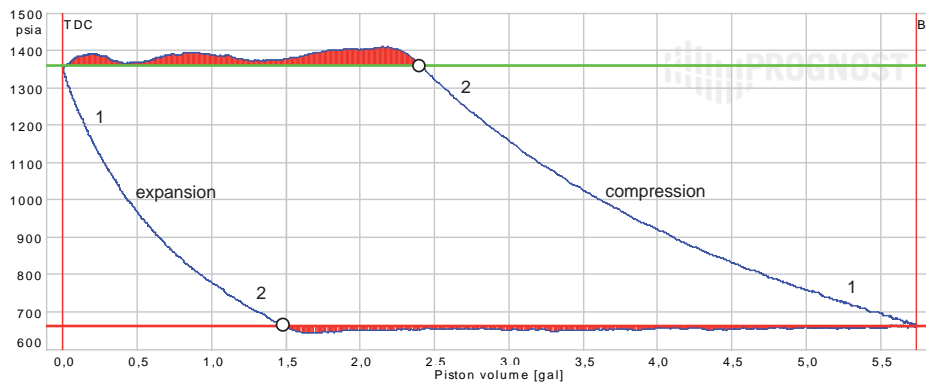


- 1 Trigger switch
- 4 Acceleration vibration sensors at crosshead
- 4 Vertical rod position sensors
- 8 indicated pressure probes for p-V diagrams
- DCS values e.g. temperatures (bearing, valves), line pressures
- 4 Acceleration vibration sensors at cylinders

Typical PROGNOST®-NT Sensor Signals

p-V diagram: the coloured areas show the suction loss (bottom) and discharge loss (top). This diagram also shows the polytropic exponents (expansion/compression) which help to automatically detect

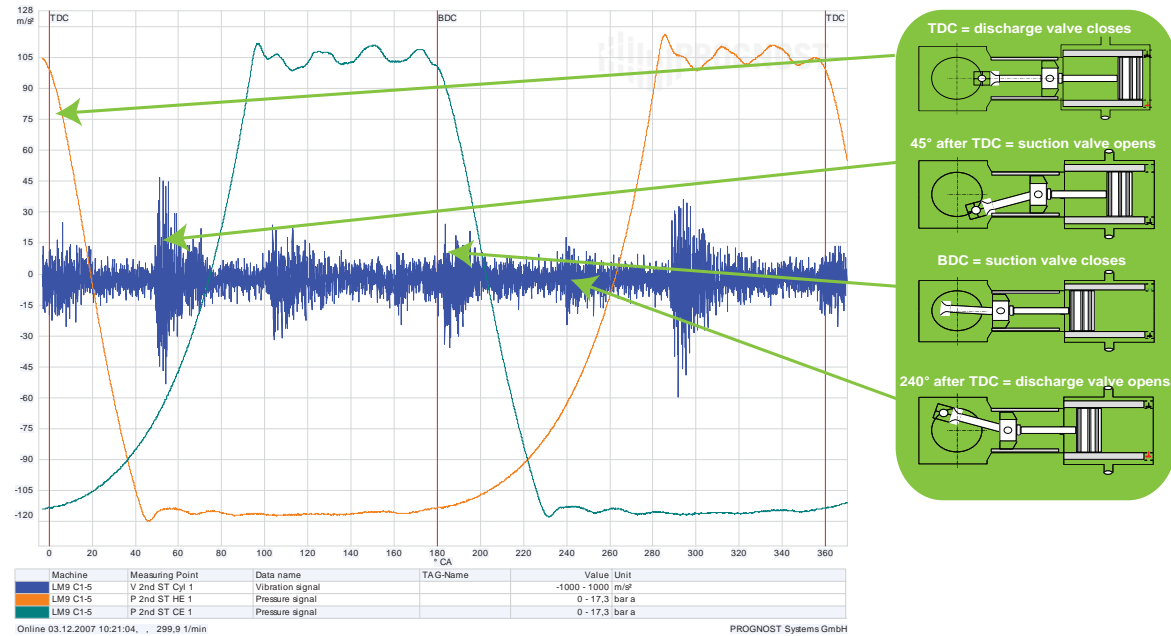
leakages of sealing components such as valves, packings, piston sealing rings in early stages. Further, this measurement shows any problems with active valve control systems.



Condition Monitoring System

Early Failure Detection

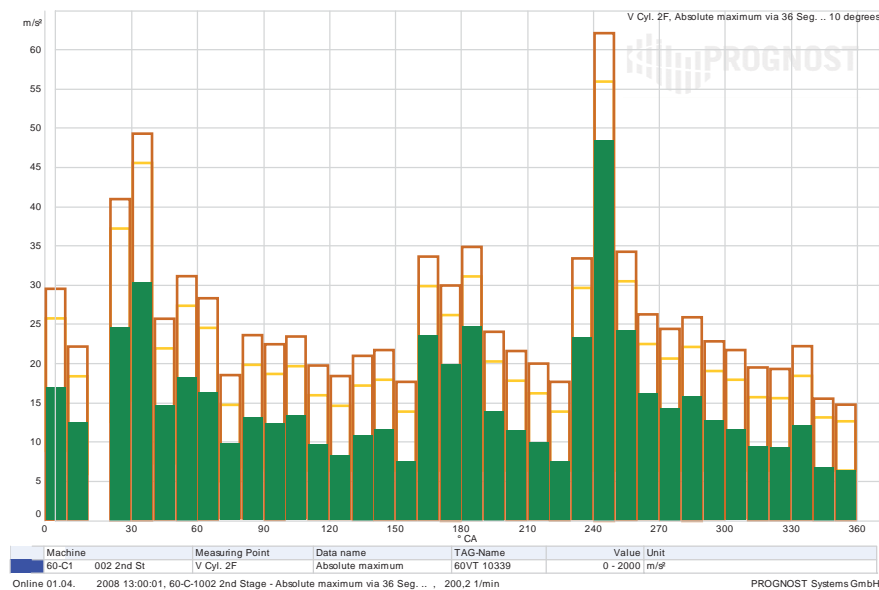
(Correlation of machine functions to crank angle)



Segmentation of on-line vibration signal with 1st and 2nd warning threshold

36 segments, each 10° crank angle, automatic monitor functions such as valve action and mechanical

integrity of piston drive to detect developing failures at early stages.

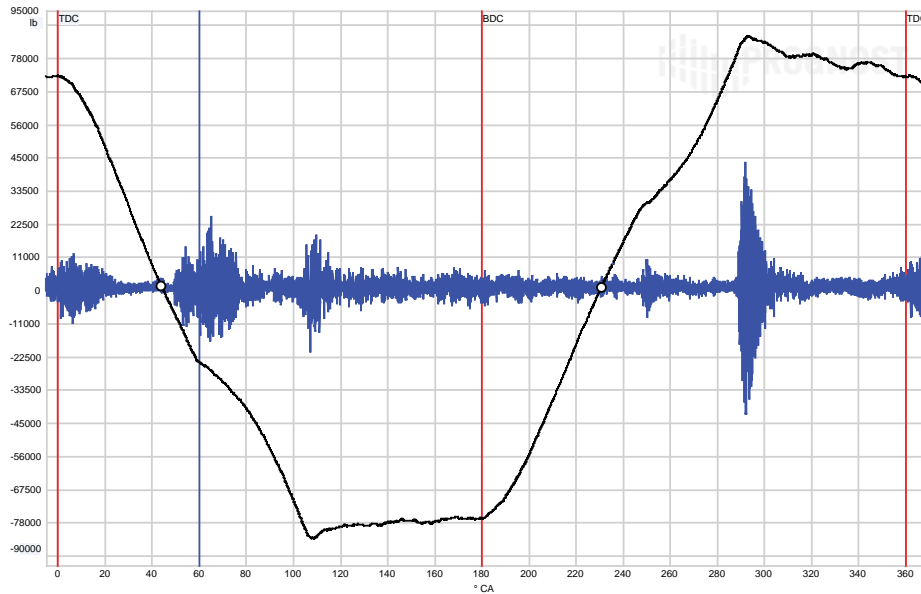




Pressure, piston rod load and rod reversal duration monitoring

Crosshead guide vibration and dynamic piston rod load derived from indicated pressure for one crankshaft revolution. The diagram shows an example with a damaged piston/piston rod-connection. The

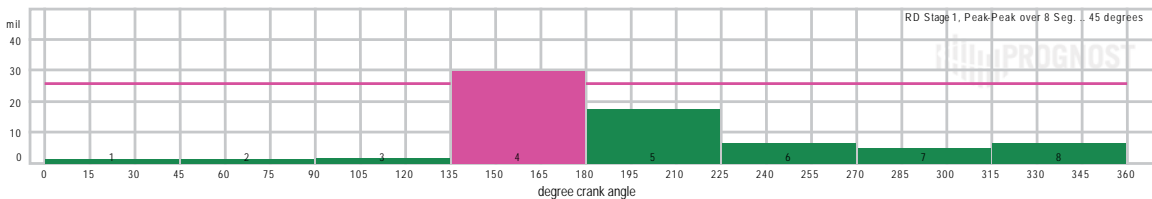
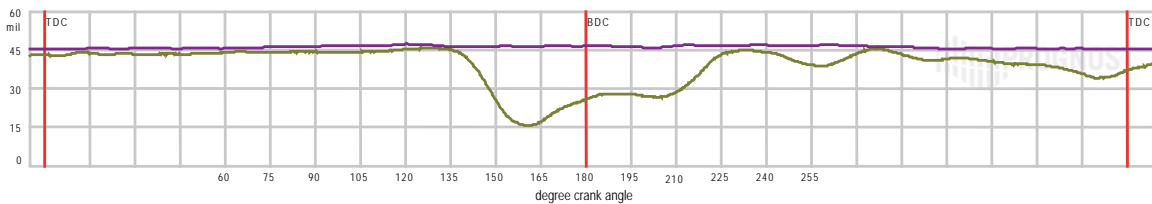
continuous monitoring of the rod reversal duration is an essential way to prevent failures of small end bearing based on underlubrication due to inadequate rod load reversal span of time.



Peak-to-Peak analysis of the piston rod position (operational run out)

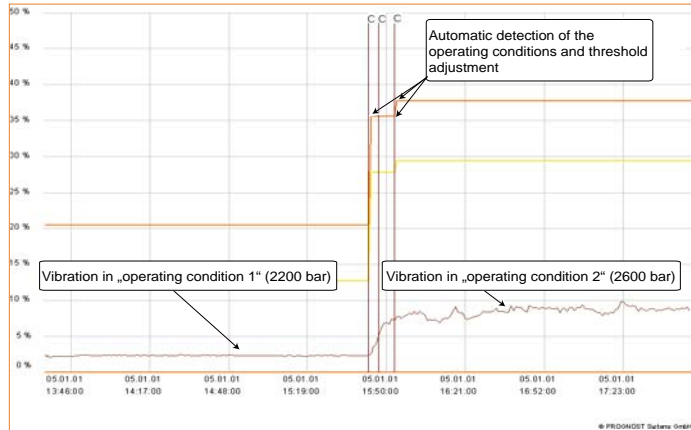
Displacement signals providing piston rod position are divided into 8 segments of 45° crank angle each for every revolution to detect critical mechanical conditions of the piston rod. The illustration shows two piston rod position signals:

purple = normal position ("good condition")
green = strong fluctuations close to BDC (bottom dead center) due to liquids inside the compression chamber

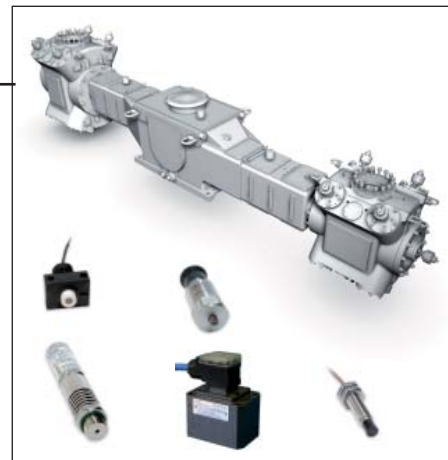


Monitoring based on operating condition

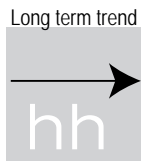
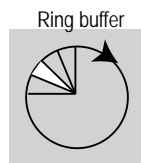
Adaptive condition monitoring based on operating condition e.g. due to changing suction/discharge pressures to avoid false alarms because of changing operating conditions.



Data acquisition and storage



Add/write new data



Period	Sample rate	Captured data	Storage and capacities
10 minutes, gapless, every revolution self-overwriting	25.000 samples/sec	All online signals and DCS values	<ul style="list-style-type: none"> - 10 minutes - Automatically on hard disc: 5 x start, 8 x stop, 10 x alarm, 8 x alert 5 x user = 36 different ringbuffer - unlimited storage on external disc / drive
1 / day 1 revolution (e.g. 12:00h) selfoverwriting	25.000 samples/sec	All online signals and DCS data and all analyses	<ul style="list-style-type: none"> - 1826 days - Automatic on hard disc - Complete time period can be stored on interal or external disc / drive
365 days self-overwriting	1 average / minute	All analyses and DCS data	<ul style="list-style-type: none"> - 365 days - Automatic on hard disc - Complete time period can be stored on interal or external disc / drive
System lifetime	1 average / hour	All analyses and DCS data	<ul style="list-style-type: none"> - System lifetime - Automatic on hard disc - Complete time period can be stored on interal or external disc / drive

PROGNOST Systems at a glance

The systems and services of PROGNOST Systems are based upon many years of technical experience and competence in the acquisition, automated evaluation, and interpretation of condition data for reciprocating machinery.

Asset Performance Management systems from PROGNOST Systems are the world-leading technology for the safe, reliable and economical operation of reciprocating machinery.

Design and production of our systems takes place in Rheine, Germany.

PROGNOST Systems office locations in Europe and USA, along with our worldwide partners, guarantee responsive and reliable on-site support.

Our customers

Continuous dialog with more than 100 enterprises from the oil, gas, chemical, and petro chemical industry on over 400 PROGNOST installations contribute to the ongoing optimization of our product and services offerings. Our customers reward this focused approach with high marks for satisfaction and long-standing brand loyalty.

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