

Experiences with performance measurements at reciprocating compressors with pressure indication

Commissioning test according to VDI 2045

There are different possibilities for a metrological check of certain characteristics of a compressor unit guaranteed by the manufacturer. In the VDI 2045 / DIN 1945, rules for an equal determination for preparation, procedure, evaluation and assessment of performance tests at a compressor are laid down. In the following, the procedure especially focused on the performance measurement by pressure indication on the basis of the named standards is presented as an effective way in a case study. The advantage of power measurement by indication is that the result shows the compaction performance, which is actually forwarded to the gas, including all levels of efficiency without additional theoretical assumptions. Furthermore, the pV-diagram (fig. 2) delivers also a condition documentation as a control of the mechanical state and the correct function of all involved components in the compression (valves, seals etc.).

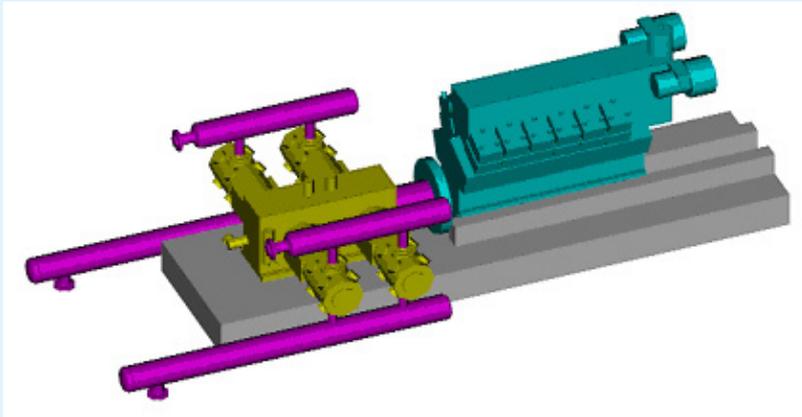
Technical data of the examined compressor unit:

Type: Lying, single-stage, 4 cylinder, reciprocating compressor,
horizontally opposed, double-acting
Engine: 12 cylinder gas engine
Nominal power: 2,150 kW
Speed range: 700 – 1,000 1/min

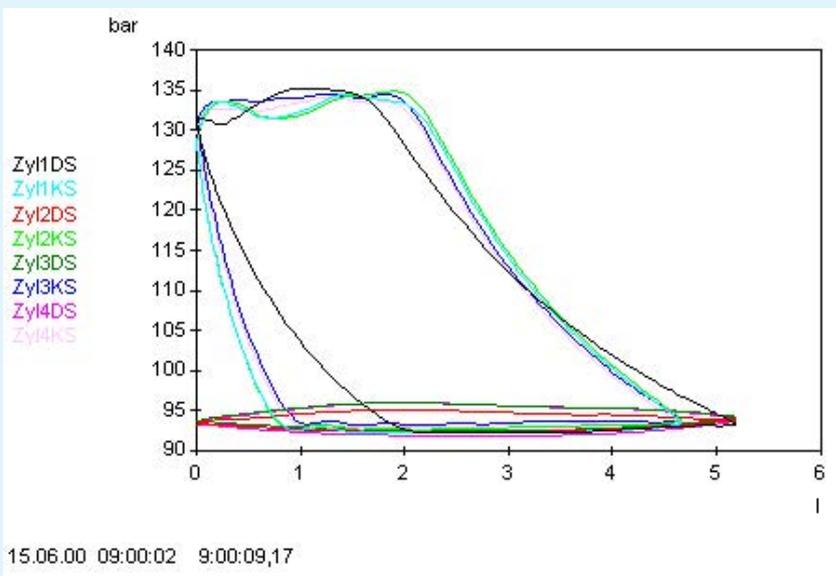
From the measured values the equivalent basic values were calculated. Furthermore, the prescribed conversion equations according to DIN 1945 (VDI 2045) were used to take into account the deviations from the warranty conditions. The results of the investigation are shown in figure 3.

The declared guarantee specifications were kept. The efficiency factor of the gas engine was above the specified tolerance limits and therefore better than requested by the operator.

MACHINE DYNAMICS



Reciprocating compressor with gas engine as drive unit.



Excerpt of the measured indicator diagrams with part load.

MACHINE DYNAMICS

Berechnungsgröße	Garantiewert	Zulässige Abweichung	Garantieband unten	Garantieband oben	Berechneter Wert	Meßspiel	Berechnungsband unten	Berechnungsband oben	Garantiebedingung erfüllt
Verdichtungsleistung P_{D31} [kW]	765,5	3%	742,53	788,46	773,5	1,44 %	762,36	784,6	ja
spez. Leistungsbedarf w_{D31} [kWh/Nm ³]	0,036	3%	0,02968	0,03152	0,0315	1,45 %	0,03104	0,03195	ja
Wirkungsgrad Gasmotor η_{D31} [%]	37	3%	35,89	38,1	39,5	1,49 %	38,91	40,08	besser als spezifiziert

Results.



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