Five simple methods to check reciprocating compressor performance

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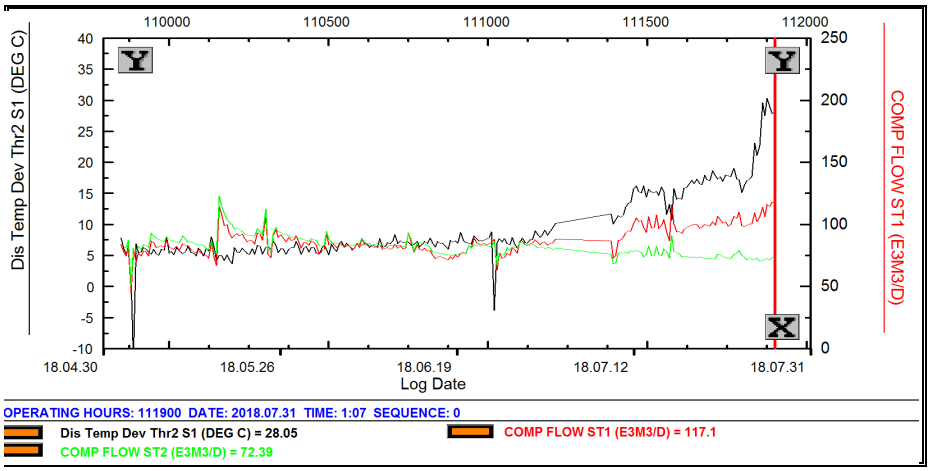
There are often occasions when it is desirable to spot-check the performance of a reciprocating compressor; just after a rebuild, as part of commissioning or when something seems different.

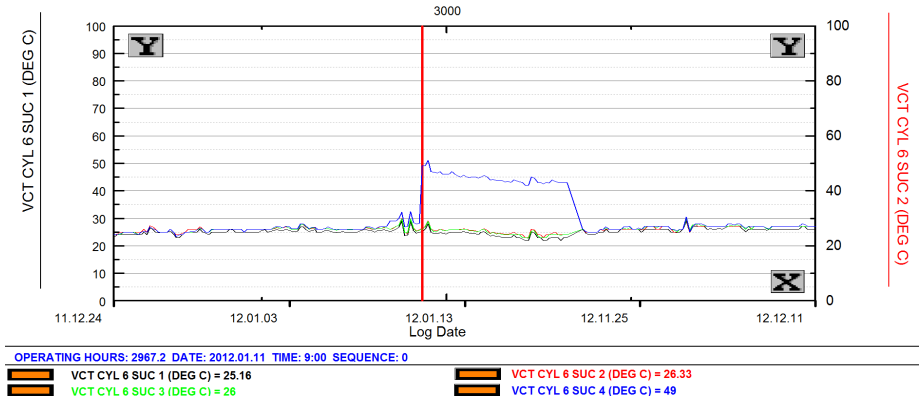
Here are a few things you can do:

#	Method Pros and cons	Rating		
		Quantification of difference in throughput	Diagnostic insight	Ease of use
1	**Compare measured flow** with that predicted by OEM sizing (or other) software. This is easy to do once a model has been created. Creating the model is not difficult but requires accurate load step numbers (clearances). + Can identify if the throughput is below capacity − Does not help identify the cause, requires a dedicated meter and loading curves or a software model	★★★		★
2	**Compare inter-stage pressures** with software model predictions + Points to which stage is at fault − Only applies to multi stage, needs a software model	★	★	★★
3	For cylinders on the same stage, **compare discharge temperatures**. This method must consider that single-acting cylinders normally have somewhat higher discharge temperatures. + Can indicate which cylinder is at fault − Only applies with 2+ cylinders on stage		★★	★★★
4	**Check for hot valves** by comparing equivalent valve cap temperatures + Capable of pinpointing which valve is leaking − May not be elevated if the valve leak is big		★★★	★★★
5	**Calculate the capacity of each stage separately** based on observed pressures and suction temperatures and look for significant discrepancy. A model is not required but best to set up an Excel calculation (which requires gas properties). If there is a significant difference, the lower value is the more accurate result, and the other stage has a problem. + No model required − Gas properties required	★★	★	★
6	**Detailed analysis of pressure-volume curves** along with ultrasonic patterns. Well, this is not so simple; included here for comparison. + The most detailed analysis − Time-consuming to conduct, requires specialized equipment	★★★	★★★	

The discharge temperature of a cylinder with a valve leak (black curve) increased, compared to another cylinder on the same stage (red), until a repair was made.



Suction valve cap temperatures show one significantly higher reading, indicating a leak.



Calculated capacity of stage 1 increases relative to stage 2 as a leak develops. The leak is verified by the rising discharge temperature deviation (black curve).