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:

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| 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).