

Influence of Large Cross Sections and Temperature on Rapid Gas Decompression (RGD) Resistance of Elastomers in the Oil & Gas Industry.

John Rogers

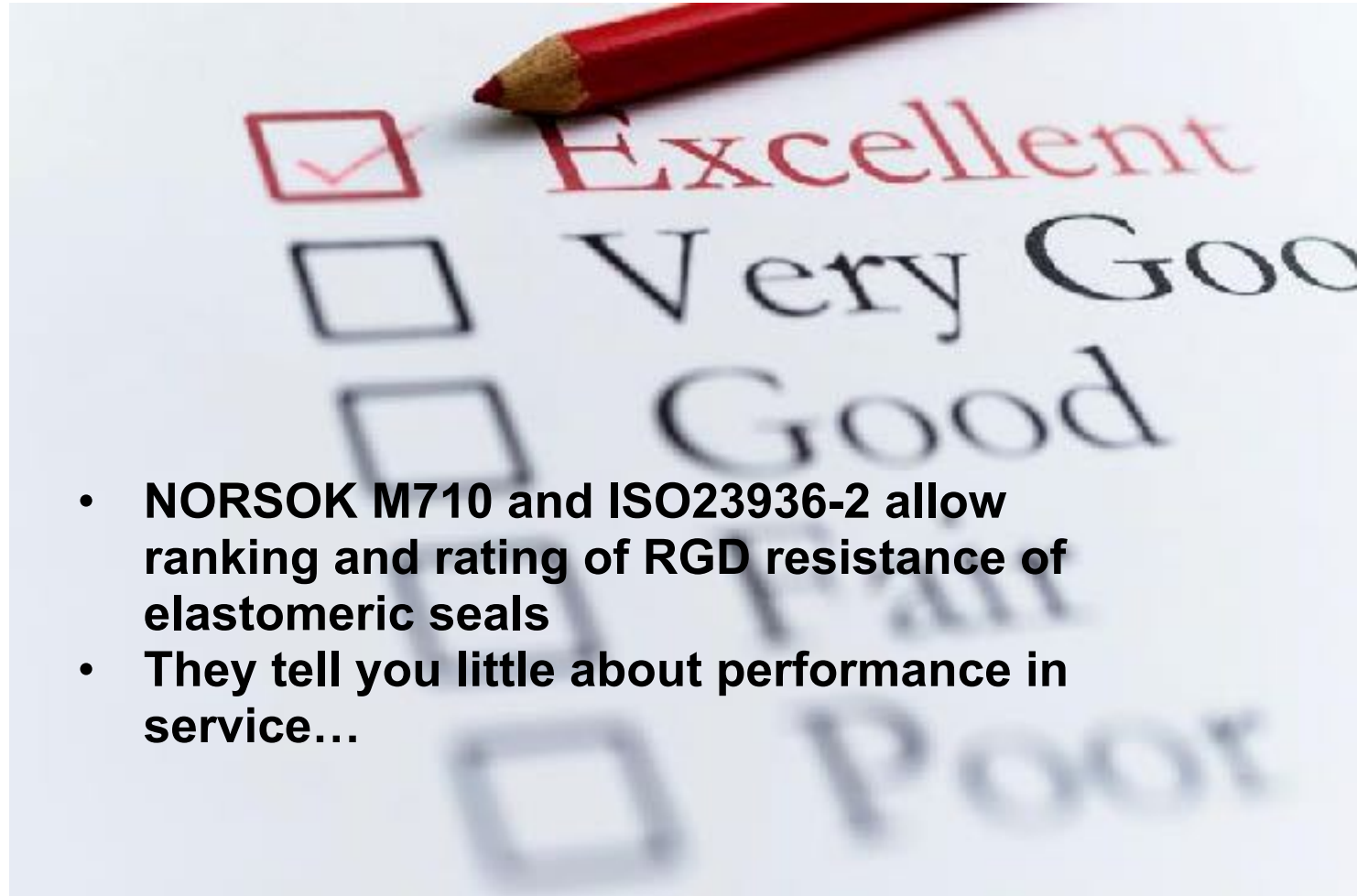
James Walker



- Large cross sections have less RGD resistance than small cross sections
- Large diameter seals and other constraints may necessitate use of large cross section seals.
- What to do?



Ranking Materials – Rating Systems



- **NORSOK M710 and ISO23936-2 allow ranking and rating of RGD resistance of elastomeric seals**
- **They tell you little about performance in service...**

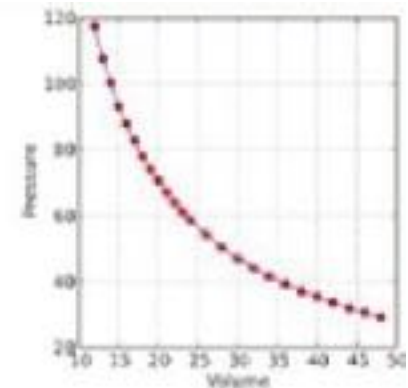
Typical Test Rigs



Boyle's law states that at constant temperature for a fixed mass, the absolute pressure and the volume of a gas are inversely proportional. The **law** can also be stated in a slightly different manner, that the product of absolute pressure and volume is always constant.

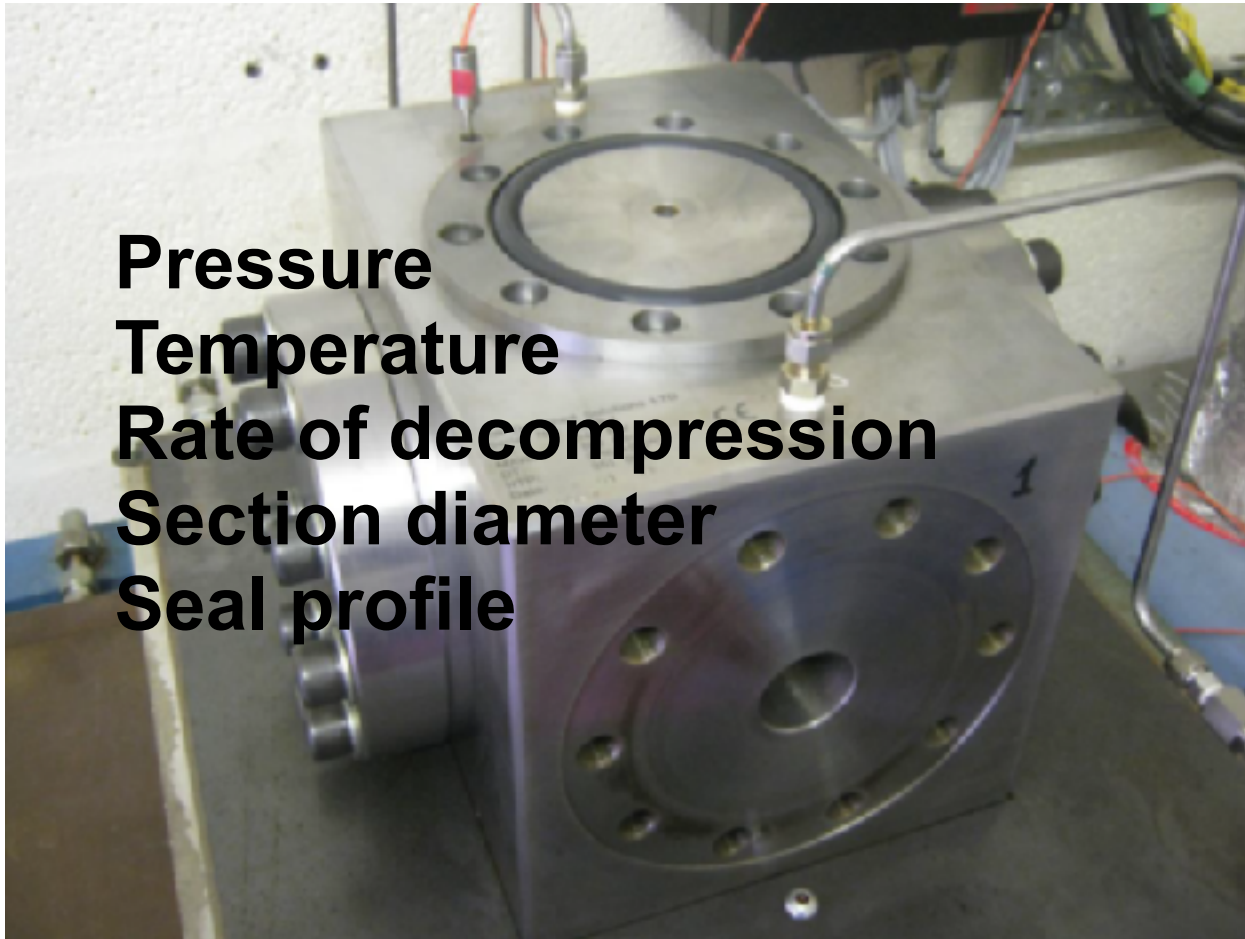
Boyle's law - Wikipedia

https://en.wikipedia.org/wiki/Boyle%27s_law



- RGD damage is identified as occurring more towards to end of the depressurisation than the beginning.
- By this time, of course, the cooling effects of the expanding gases will be most noticeable
- **Thus testing at lower temperatures can be justified.**

Bespoke Testing



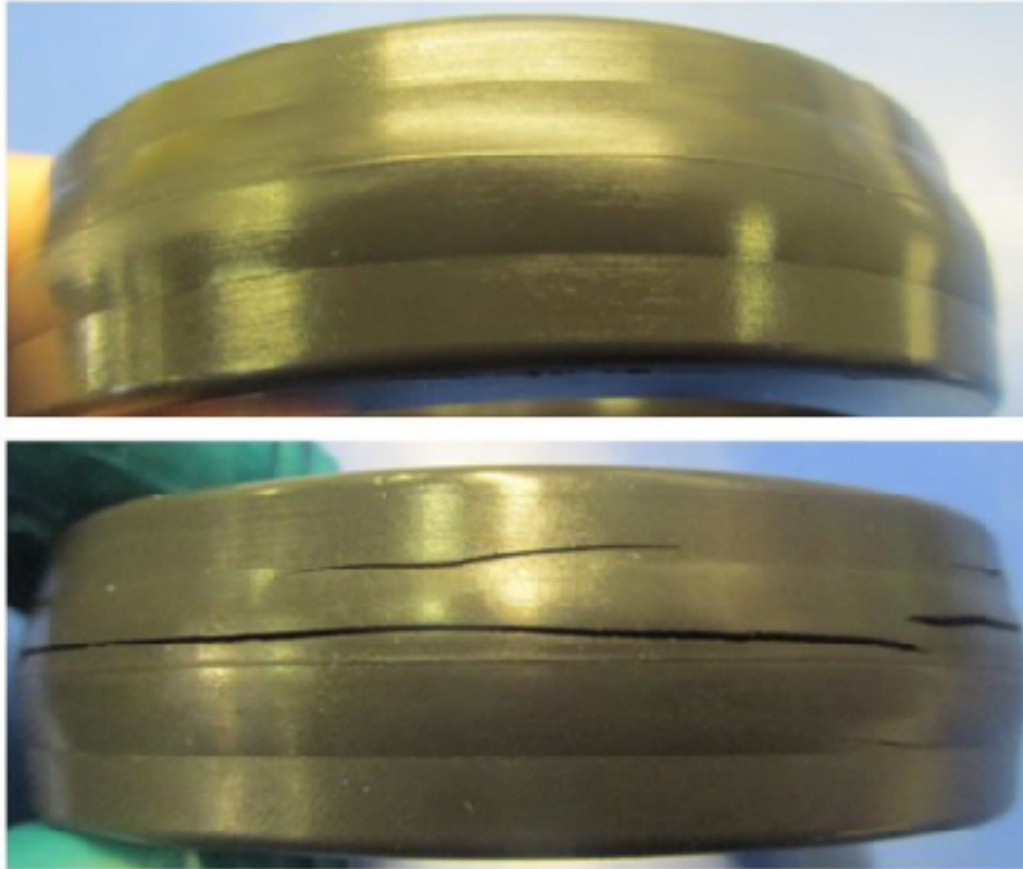
Identify service conditions and sealing system of specific application.

- Operating temperature?
- Operating Pressure?
- Rate of depressurisation?
- End pressure value (may not be zero)?
- Media – this may influence RGD resistance?
- Seal profile – O ring, spring seal?
- Groove fill and compression?

Design the test

- Having identified the service conditions, an appropriate RGD test can be devised:
- Lower temperatures will be helpful as mentioned earlier.
- If blow down rates and conditions are known or can be controlled, lower depressurisation rates may be considered.
- Media effects may be explored by testing pre-soaked samples
- Different seal profiles may be tested to assess their effects.

Large Section (approx 40mm x 15mm)



Springsele® at 690bar



RGD damage does not automatically mean seal leakage!
Often the first time the damage is identified is when maintenance occurs and the housing is split to reveal the damage!



- If large cross section seals are deemed necessary, it is beholden on the operator to ensure risk is minimised.
- If assessment is based on standard Norsok and ISO23936-2 test conditions, no suitable elastomer may be identified!
- Tests, adapted to the specific application, can identify the most appropriate elastomer and yield a way forward.

Minimising RGD Risk

Suitably modified tests may identify additional means of minimising risk:

- Controlling depressurisation rate
- Reducing temperature prior to controlled depressurisation
- Stepped reduction in pressure
- *Replace seals when maintenance carried out*

Caution...

- RGD resistance is not sufficient to select an elastomer!
- Material must also be resistant to the media in the specific application
- And cope with temperature range too!



In Summary

- Selecting the best elastomer and seal type requires close collaboration between end user and seal supplier

