

Specification of Elastomeric Materials for Rapid Gas Decompression Applications

A UK Health and Safety Executive guideline to assist in the prevention of decompression damage in elastomeric seals

The Challenge

Seal damage and observed gas leaks caused by Rapid Gas Decompression (RGD) in elastomeric seals have been reported in many types of equipment in the oil and gas industry. In the past 20 years, there has been substantial advance in understanding the failure mechanism, decompression resistant material development, seal function test specification and software prediction techniques.

Many of the best performing decompression resistant materials are however non-conventional elastomers with very special material characteristics. This follows the industry trend of producing stiffer elastomer formulations, which have low elongation at break. This RGD performance increase is counter-intuitive and brings compromises in terms of ease of installation and compression set. The move to more exotic material and more aggressive or extreme operating environments places new demands on the qualification and certification of these materials for which industrial best practices and guidelines are urgently required.

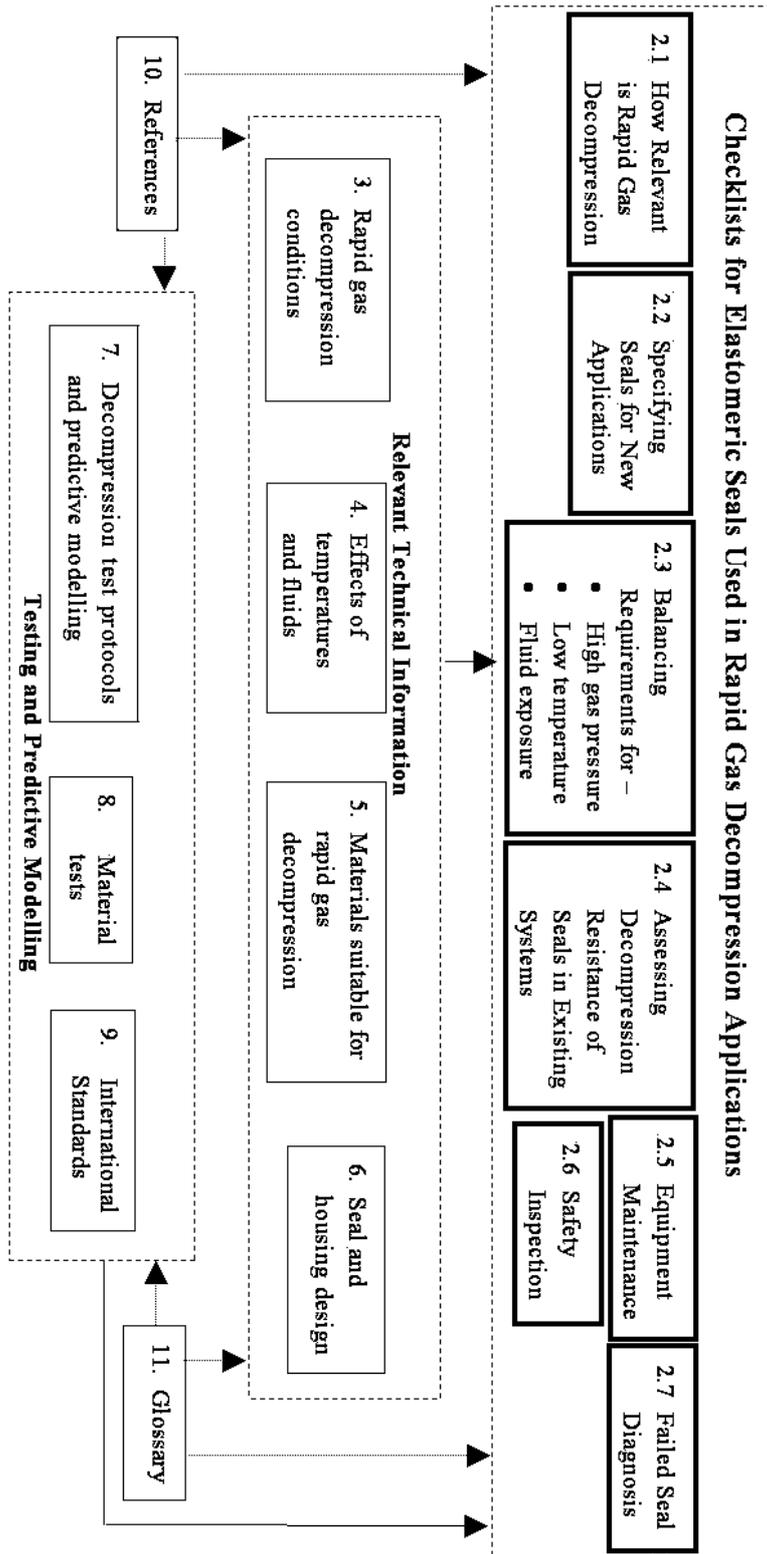
The Approach

Research undertaken by BHR through its MODES consortium has helped to raise understanding of seal material characteristics and their effect on overall sealing performance. This work forms the basis of an HSE best practice for avoiding failures due to RGD. A guideline has been being prepared by BHR for the UK Health and Safety Executive to assist in the prevention of decompression damage in elastomeric seals by providing systematic approach for (i) specifying new seals, (ii) assessing decompression resistance of seals in existing systems, and (iii) failed seal diagnosis. It also aims to raise awareness in the industry in general. Seven checklists, shown on the flow diagram, have been developed encompassing information that should be considered when designing any sealing system with a potential RGD risk.

The Results and Benefits

Provision of an HSE document on rapid gas decompression for the oil and gas industry is a useful tool for field engineers, designers and safety inspectors, presented with the prospect of RGD events. Being able to ascertain which type of testing is needed and then understanding the test results will prove invaluable to engineers required to specify materials for RGD.

The results of finite element analysis methods developed by BHR and shown here, also demonstrate that a thorough prediction methodology can provide a useful cost-effective approach to solving RGD problems and reducing expensive RGD test work. When employed in conjunction with relevant qualification testing such as NORSOK M-710 modelling provides a powerful method for mitigating against this potentially catastrophic phenomena.



Structure of the HSE Guideline

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