DOC 48: Elastomeric Seals

Hygienic Aspects of Elastomeric Seals in Food Processing and Packaging Components

Introduction

- Complex equipment and components are often used in food processing
- Elastomeric seals are used to prevent product contact to assembly features or to seal moving parts
- DOC 48 addresses hygienic aspects of elastomeric seals in food processing and packaging components
- Shall raise awareness of basic design principles
- The Guideline refers mainly to O-Rings – the type of seal most commonly used

Basic Design Principles

When designing a seals in its housing you need to:

- choose the *best suitable elastomer* for the seal

  (dependent on given application, operating conditions and normative regulations)

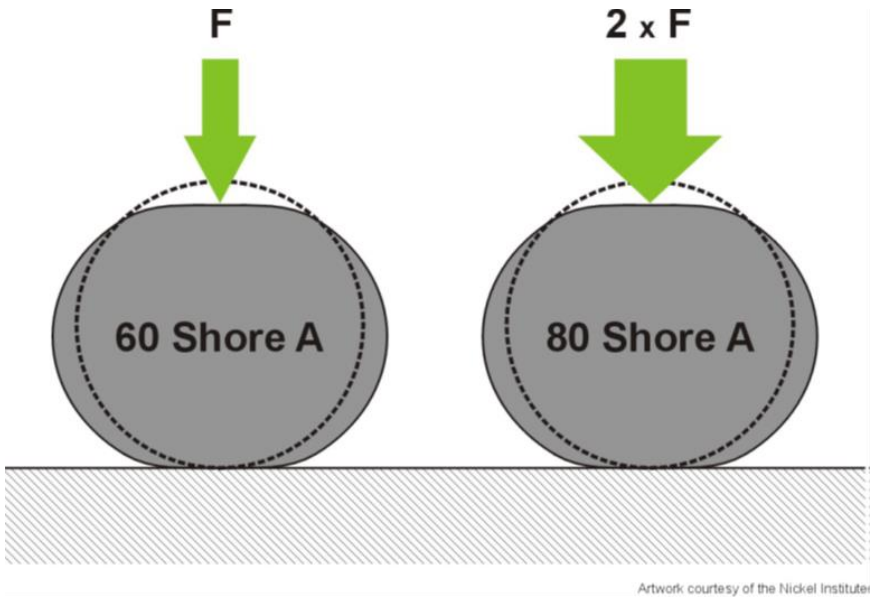
- ensure a *surface quality* that offers no retention space to product soils and microorganisms

Compression of Elastomers

Usually: contact pressure between seal and groove > pressure in the given application

Elastomers are *incompressible* => deformation is possible, reduction of volume not.

Pressure needed to deform a seal depends on its hardness



Artwork courtesy of the Nickel Institute

Groove size and groove fill

- Groove size minimum = volume of the seal
- Seal volume increases with increasing temperature and shrinks again with sinking temperature
- Groove size must be
  - big enough to include seal volume plus expected thermal expansion volume and
  - small enough to ensure sufficient contact pressure

Alignment of Couplings

- Flow shadows, cleaning and draining problems might be caused by misalignment of a coupling
- Design features like guiding elements can ensure this

- Seal flushness – ideally no protrusion and no recess with the bore of the pipe
- In practice only an approximation to the ideal is possible

Behaviour of Elastomers used as Seals

Effects of

- *Temperature* (ageing, thermal expansion, temperature cycling)
- *Pressure* (seal deformation, internal stress, FEM)
- *Mechanical stress* (degradation of elastomers, cracks)
- *Media* (elastomers, food products, cleaning agents and sterilizing agents should interact as little as possible)

Hardware Design

- Example for a groove design for reaching an aseptic standard (DIN 11864)

- The „elevator effect“ and the advantages of double seal design

Trouble shooting

Overview over

- Pictures showing most common seal damages occuring in practice (excessive friction, over-compression, overfilling, explosive decompression, gap extrusion, grease swelling, etc.)

- Failure documentation for finding the root cause

Handling of Seals

Packaging: for protection

Storage: conditions for a long shelf life

Legislation and Requirements

- *Documentation:* compliance of material, design and fabrication to the
  - a) food-business operator's specification and
  - b) Framework Regulation EC 1935/2004
- *Traceability:* Framework Regulation demands traceability one stage backwards and one stage forward for all components including seals
- *Marking* of seals or the smallest possible unit (smallest bag): => traceability and positive identification of seals after removal

General information

- Technical information provided by suppliers
- Leading standards and Regulations => Annex A
- Normative References for food contact materials => Annex B

Thank You

Guideline **Document 48** – available soon @ **EHEDG**