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Experimental Tensile Strength Analysis of Different Manufacturer Oring

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Abstract

Importance and Purpose of Tensile Testing on ORings The tensile test on rings and especially on O-rings is primarily carried out for quality assurance reasons. The tensile test provides information about the formulation quality (evaluation of the absolute values, strength of the material, and determination of formulation changes). For example, it is not possible to detect an exchange of the polymer of compounds with different molecular weights and/or a different molecular weight distribution (e.g. highviscosity press mix by low-viscosity spray mix) by infrared spectroscopy (IR), but only by tensile testing and possibly by long-term compression set tests. Furthermore, the tensile test provides information on subsequent changes compared to the prototype condition. The Influence of Processing In the case of some O-rings, due to poor processing, it is not the strength value of the material that is determined, but the lower strength of the joining line (= confluence point of the rubber compound in the production of the O-ring in the injection mold) at which the O-ring tears. This problem depends on the material (e.g. certain acrylate rubbers), the tool and the process parameters. The joining line can usually be detected in advance by a visual and strain test or by relatively large scatter in a tensile test. Typical for the scatter in tensile tests of O-rings are 5-10%-points standard deviation related to the mean value of the elongation at break or the tensile strength. An important characteristic of good processing is the achievement of the optimum degree of vulcanization. However, there is no generally valid optimum, but this must be determined depending on the intended application of the elastomeric component. If, for example, the tear resistance is the most important material parameter for the finished product, a different degree of crosslinking or a different cross linking density must be aimed for than if, for example, a low

Methodology

State of the Art for Good Tensile Strength and Elongation at Break Values on O-rings:

Usually, certain tensile strengths and elongations at break are only required in specifications from seal users (e.g. industrial applications, automobile manufacturers, aviation, etc.). These values must then be determined on standard specimens produced under ideal conditions. More and more often, however, specifications or component drawings also contain material properties that must be explicitly tested on the O-ring. However, a seal user who is not very deeply familiar with this subject usually cannot evaluate whether these required values in company specifications correspond to the state of the art or not. ISO 3601-5 21 is the first internationally valid standard that represents a good state of the art irrespective of external constraints or company traditions and considers the differences between tensile tests on standard specimens and O-rings. In addition, it also specifies nominal values for the tensile test of hot-aged standard specimens and O-rings. The following Table 5 shows impressively how the test

values for the most important basic elastomers can deviate between standard specimens and O-rings in the delivered condition in order to still correspond to a good state of the art.
Target specifications for tensile strength and elongation at break for both standard specimens and O-rings according to ISO 3601-5, which correspond to a good state of the art. (NB: The numerical value behind the material stands for the hardness grades in IRHD-CM , (S) = sulphur cross-linked material, (P) = peroxide cross-linked material, the tests on the standard specimens (2mm test plate) are carried out according to ISO 37, the tests on the O-rings according to ASTM D1414) With regard to these limit values for O-rings according to Table 5, it should be noted that these refer formally only to the dimension 24.99x3.53 mm and to ideally vulcanized O-rings produced in the laboratory for the definition of the formulation quality. Nevertheless, these limit values can also be achieved on series O-rings, but this would then have to be agreed between supplier and customer in addition to the requirements of ISO 3601-5. However, ISO 3601-5 regulates mandatory hardness and compression set values for O-rings.

Result in O-ring test :-

Sr. No	O ring Specimen Type 1	Breaking Load (Kg)	Elongation (mm)
1	C/S Dimeter-4.5 mm and Diameter of o ring 85mm	25	154
2	C/S Dimeter-4.5 mm and Diameter of o ring 85mm	27	158
3	C/S Dimeter-4.5 mm and Diameter of o ring 85mm	29	160

Sr. No	O ring Specimen Type 2	Breaking Load (Kg)	Elongation (mm)
1	C/S Dimeter-4.7 mm and Diameter of o ring 85mm	19.2	250
2	C/S Dimeter-4.5 mm and Diameter of o ring 85mm	18.5	240
3	C/S Dimeter-4.5 mm and Diameter of o ring 85mm	20	230

CONCLUSION

It is Observed That The O ring having good Surface Finish is More load carrying capacity and low Elongation. But for poor surface Finish O ring load carrying capacity is low but elongating is more

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