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TITLE

## HIGH TEMPERATURE TESTS OF O-RINGS AND MOLDED SEALS

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# HIGH TEMPERATURE TESTS OF O-RINGS AND MOLDED SEALS

References:

1. HW-25937, J. P. Cooke, "Exposure of Two Different Types of Rubber to Pile Water".
2. HW-32284, J. P. Cooke, "Final Report, Exposure of C Pile Pigtail to Pile Water".
3. HW-32428, J. P. Cooke, "Exposure of Several Different Rubber Compounds to Pile Water".
4. KLX-1092, Kellex Corporation, "Summary Report of the Gasket Development Program".
5. CRD-TI-147, S. G. Zizzo and W. E. Browning, "Radiation Effects on Organic and Inorganic Materials for Possible Use in MTA".
6. ORNL-928, Sisman and Bopp, "Physical Properties of Irradiated Plastics".

## INTRODUCTION

Present studies directed toward increasing Reactor operating temperatures and proposed designs for new rear face nozzles will require the use of high temperature resistant O-Ring seals and packing seals. The Reactor Process Sub-Section has been conducting tests of various seal materials to evaluate their service life in high temperature water. This memorandum summarizes the effect of pressurized hot water on a variety of seal materials.

## SUMMARY AND CONCLUSIONS

The test consisted of sealing the samples in six inch sections of one-half inch pipe, half filled with process water. The sealed samples were then heated to 150 C and held at this temperature for an extended period. With the exception of radiation exposure, the test was intended to simulate accelerated pile conditions.

SUMMARY AND CONCLUSIONS (Cont'd)

The test results were;

1. All silicones failed due to decomposition after a one week exposure.
2. The neoprene sample embrittled excessively after one week.
3. The Buna N samples began to harden after two weeks exposure.
4. Kel-F and Teflon showed no apparent change after two weeks exposure.
5. Neither Kel-F or Teflon evolved corrosive gases under the test conditions.

It is concluded from these tests that Kel-F and Teflon are suitable for use in water at 150 C. and that all other seals tested are not suitable. Literature data indicates however that Kel-F and Teflon evolve fluorine and eventually disintegrate upon high radiation exposure. Tests are being conducted to determine the effect of fluorine evolution on gasket seats and a determination is being made of the radiation dosage rate encountered at the locations where the seals will be used.

DISCUSSION

In lieu of a discussion of test results, photographs are appended to this memorandum which show the seals after the test and give the results of the test.

R. W. Pitman
Reactor Operation Engineering
Process Sub-Section
REACTOR SECTION

RWP/blh

[redacted]

O-Ring Material of Neoprene Used at 100-B. Filler Undisclosed. Some Embrittlement.

[redacted]

G.E. Molded Seal Material of Silicone No. SE-380. Decomposed.

[redacted]

Hy[illegible]lon Seal on 475° F Steam Line for Two Days. Valve Used Very Little. Much Embrittlement.

[redacted]

Kellogg. O-Ring Material of KEL-F. Slight Cracks, if Any, on Surface. No Other Apparent Change.

[redacted]

Kellogg. O-Ring Material of KEL-F. Under Test for Two Weeks. No Apparent Change.

[redacted]

O-Ring Section of Buna N in 5% H202 Badly Oxidized.

* All Samples Were in Sealed Containers Half Filled with Process Water under 85 psi, 150°C for One Week Except Where Noted Otherwise. This is an Accelerated Test to Duplicate in Large Part the Anticipated Environment.

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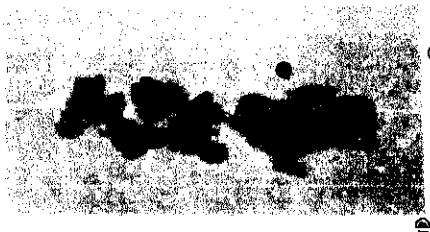
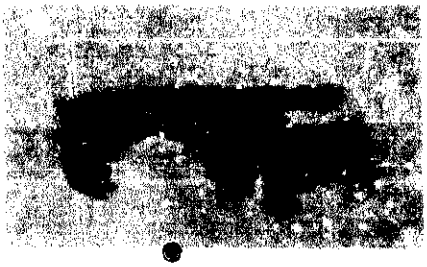
G. E. O-Ring Material of Silicone No. SE-360, Decomposed.

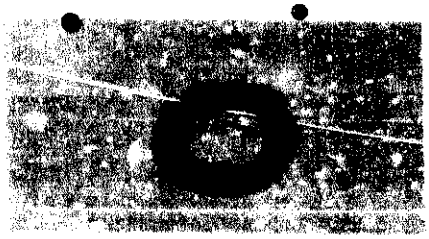


Dow Chemical O-Ring Material of Silicone 50-24-480, Decomposed

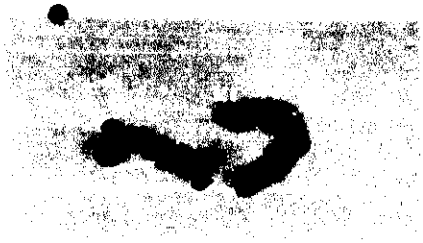


Melrath O-Ring Material of Silicone. No Apparent Change. Container Leak.

Melrath. O-Ring Material of Silicone. Decomposed.



Precision Rubber O-Ring of Undisclosed Rubber No. 1203. 70. Slight Embrittlement.



Precision Rubber O-Ring of Undisclosed Rubber No. 1203. 70. Bad Embrittlement. Under Test for Two Weeks.

All Samples Were in Sealed Containers Half Filled with Process Water under 65 psi, 5[illegible]°C for One Week Except Where Noted Otherwise. This Is an Accelerated Test to Duplicate in Large Part the Anticipated Environment.

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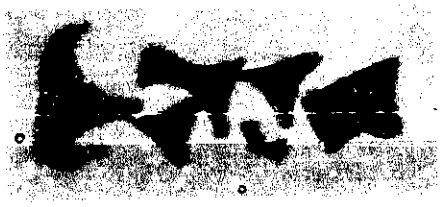

Dow Chemical O-Ring or Seal Material of Silicone, No. 80-24-480. Decomposed.

G. E. O-Ring Material of Silicone No. SE-370. Decomposed.

Precision Rubber O-Ring Section of Buna N. Filler Undisclosed. Slight, If Any, Embrittlement on Ends.

Precision Rubber. O-Ring Section of Buna N. Embrittlement on Ends, None Otherwise. Under Test for Two Weeks.

Melrath Molded Seal Material of Teflon. No Apparent Change.

DuPont O-Ring Material of Silicone. Became Very Soft. Unuseable.

All Samples Were in Sealed Containers Half Filled with Process Water under 85 psi 150°C for One Week Except Where Noted Otherwise. This Is an Accelerated Test to Duplicate in Large Part the Anticipated Environment.

[redacted]