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INTER-COMPANY CORRESPONDENCE

UNION CARBIDE NUCLEAR COMPANY

A Division of Union Carbide and Carbon Corporation

(KLI-3695)
K-5010

To: Mr. J. R. McGuffey
Plant Engineering

Plant: Oak Ridge Gaseous Diffusion

Date: January 26, 1956

Copies To:

Subject: HAYNES ALLOY 25 SPRING MATERIAL

KLI-3695 [INTER-COMPANY MEMO]

Introduction

AECU-3256

Springs of Haynes alloy 25* have been in use in the Adams carbon filters in the Feed Plant for a period of five months at an operating temperature of about 1050°F. The springs function to hold the carbon filter element under a constant compressive load to prevent leaking and to minimize the danger of breakage of the element. At your request these springs have been tested and compared to new springs to determine whether significant changes have taken place in their properties during this period of service.

Summary

Springs held at 1200°F. for 16 hours showed a permanent set which reduced the initial 400 pound load to about 250 pounds. The final length of these springs was about the same as that measured on springs removed for inspection after five months at 1050°F. There was no change in spring constant after the 1200°F. test exposure nor after the service exposure at 1050°F.

Further testing after an additional 4 to 6 months service would permit an estimate to be made of the creep rate in order that a suitable maintenance interval might be established.

* Approximate composition: 20% Cr, 15% W, 10% Ni, 1.5% Mn, 1.0% Si, 2.0% Fe, 0.15% C, balance cobalt.

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January 26, 1956

Data and Discussion

Initial tests on the new springs involved a room temperature determination of the spring constant and a check on the effect of the contemplated 1200°F. operating temperature. The spring rate at room temperature was found to be about 800 pounds per inch in the vicinity of the design load of 400 pounds. After determining the load-compression characteristics of two new springs, these springs were clamped in fixtures under loads of 400 and 500 pounds respectively and placed in a furnace for 16 hours at 1200°F. Upon removal from the fixtures, 250 and 300 pounds respectively were required to compress the springs to the same length as that occupied in the fixture, indicating that some creep had taken place.

Springs that had been in service for five months at a temperature of about 1050°F. were later tested to determine the effects of the service conditions on the properties of the springs. The 400 pound design load that had been placed on these springs in initial assembly was found to have resulted in about the same amount of creep as had been obtained with the new springs after the 16 hour, 1200°F. heat-treatment under load. The permanent set that had occurred amounted to about 3/16 inch, equivalent to a 150 pound decrease from the 400 pound assembly load.

All the springs were found to be of approximately the same length after the 5 months of service, although the lack of perfectly square ends made it necessary to substitute for the free length value a length measurement taken under a light load (20 lb.). Based on this value as a "free length," the spring compression for a 400 pound load ranged from 0.46 to 0.51 inches. The spring length under this load covered a range of 4.65 to 4.75 inches, and the spring constants varied from a low of 780 pounds per inch to a high of 830 pounds per inch.

Since a significant amount of creep has been observed in these springs under normal operating conditions, further tests seem to be advisable. Tests on springs that have undergone an additional four to six months of operation would make it possible to estimate the creep rate, and from this data a suitable service interval could be established for readjusting the spring loads.

/s/ R. T. Ziehlke
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