From: Goutam Bagchi NRR
To: David Terao; Frank Grubelich; John Fair; Mark Hartzman; William Koo
Date: Wednesday, February 06, 2002 3:29PM
Subject: PBMR: High Temp Mat

I have attached a file that contains excerpts from a HTGR Workshop Report. I have high lighted a couple of paragraphs. If you open it in Word Perfect, you will see the yellow high light.

Thank you,
Goutam
301-415-3305

B-28

5

United Kingdom

Like Japan, UK has its own materials codes and does not use the ASME codes. Therefore, direct extension of UK materials qualification data for US applications may be difficult. Furthermore, because of the steam cycle, the exit gas temperatures in the AGRs are limited to about 600 ^{o}C. Data at that temperature and 1050 psi are available. However, in the Brayton cycle, one would expect greater high-temperature challenges. Therefore, it was recommended an NRC research program include materials studies under prevailing HTGR conditions.

UK has encountered fatigue, vibration and erosion problems in the AGR pipes. Because of vibrations, the pipe insulation has experienced major integrity problems. The studs that hold the cover plates do show fatigue. Much relevant experimental work has been done in UK. It is believed that consideration of HTGR design details is important and both inside and outside insulation in various pipes need to be evaluated.

United States

Creep and creep-fatigue life of high-temperature materials are important considerations in the HTGR applications. It is believed that non-destructive testing of decommissioned AVR in-service components may yield significant insights in this respect. Two classes of high-temperature materials are used in gas-cooled reactors -- low carbon steel and various other alloys. Under off-normal conditions, the components could be exposed to temperatures as high as 1000 ^{o}C which can last for 1000 hours or longer. Code Cases for expansion joints are being developed. The ASME Code Case 499 allows carbon steel applications under limited conditions. Recently, a modified nine-chrome-one-moly alloy has also been accepted into this code case. However, NRC has not yet accepted and endorsed Code Case 499. Therefore, its acceptability is yet to be determined.

Stainless steel -304 and -316, and a quarter-chrome-one-moly steel alloy that could be exposed to up to 1400 ^{o}C is being tested for GT-MHR. Some of these materials have been tested in helium environment; however, coolant impurities could significantly affect the high temperature materials performance. Carbon-carbon composite materials can withstand as high temperatures as does graphite $_{2}$. Some data are available. Electric Power Research Institute (EPRI) is currently funding an international database of past gas-cooled reactor experience on the contaminants and fission products in circulating helium. This effort is expected to be completed by the end of the year 2001. The EPRI database will be helpful in deciding on decontamination techniques and choices of possible blading material for future rotating machinery for the Brayton Cycle. Cracking problems were reported in the Fort St. Vrain steam generators (SG). There were two incidents of SG leaks. However, the root cause could not be determined as the licensee could not get a sample.

Mail Envelope Properties (3C619225.4A4 : 24 : 19016)

Subject: PBMR: High Temp Mat
Creation Date: Wednesday, February 06, 2002 3:29PM
From: Goutam Bagchi

Created By: GXB1@nrc.gov

Recipients
nrc.gov
owf2_po.OWFN_DO
DXT (David Terao)
FXG (Frank Grubelich)
JRF (John Fair)
MXH (Mark Hartzman)
WHK (William Koo)

Post Office	Route
owf2_po.OWFN_DO	nrc.gov

Files	Size	Date & Time
PBMR High Temp Mat.wpd	6527	02/06/02 03:20PM
MESSAGE	800	02/06/02 03:29PM

Options
Expiration Date: None
Priority: Standard
Reply Requested: No
Return Notification: None

Concealed Subject: No
Security: Standard