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## 10CFR21 REPORTING OF DEFECTS AND NON-COMPLIANCE

COMPONENT: Governor Drive Coupling Element  
P/N AK-007-001

SYSTEM: Enterprise Emergency Diesel Generator Sets

CONCLUSION: Reportable in accordance with 10CFR21

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Date: Sept. 16, 2005

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REV	DATE	PAGE	DESCRIPTION

**COMPONENT:**

Governor Drive Coupling Element  
P/N AK-007-001

**SUMMARY:**

Engine Systems Inc. (ESI) has concluded an investigation into a condition reported by the Shearon Harris Nuclear Power Plant with regard to the governor drive coupling element, P/N AK-007-001. There exists a potential problem in which ESI supplied coupling elements fabricated from an incorrect material.

The coupling assembly is used on a vertical drive shaft to transmit power from the engine gear train to the governor in order to allow engine speed sensing and regulating capability (see Figure 1 below). The element resides in compression within the coupling and serves to transmit torque, isolate vibration, and compensate for minor misalignment between the associated coupling halves (see Figure 2). Failure of the element would cause the coupling assembly to fail which would result in inoperability of the governor.

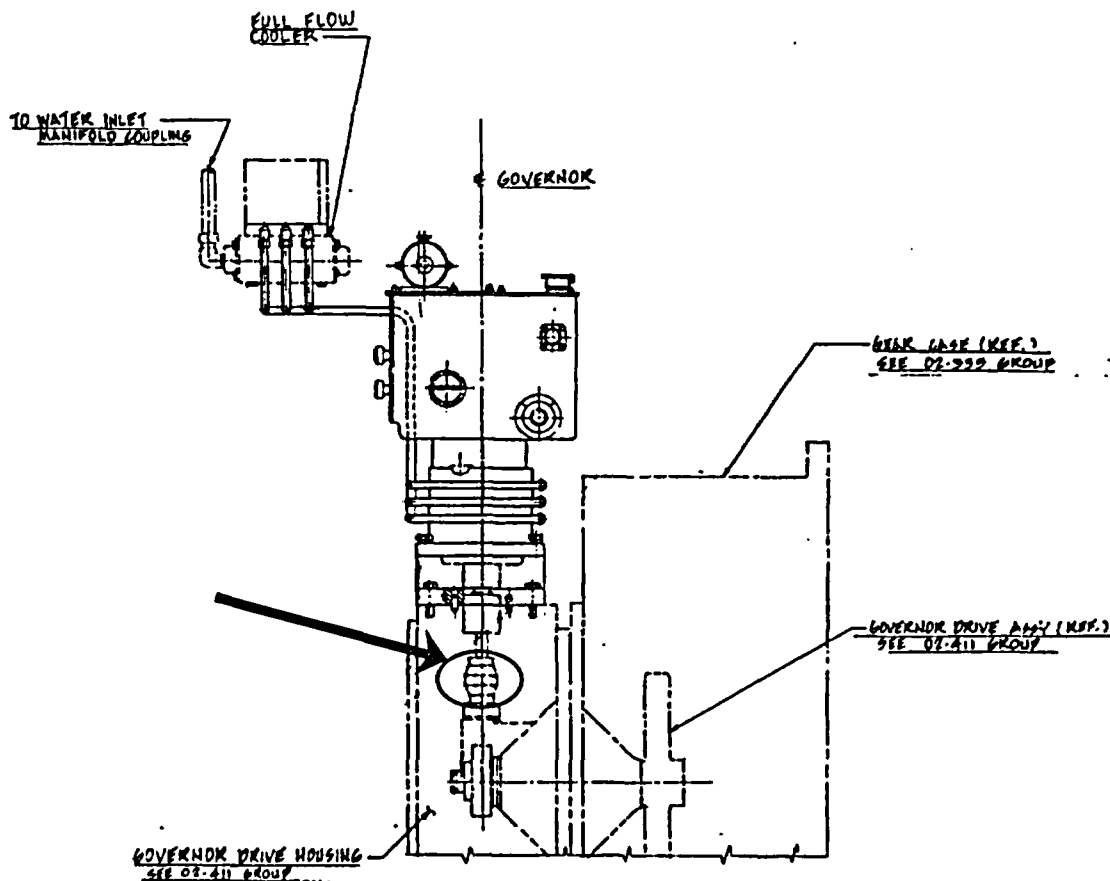


Figure 1: Location of coupling installed in system

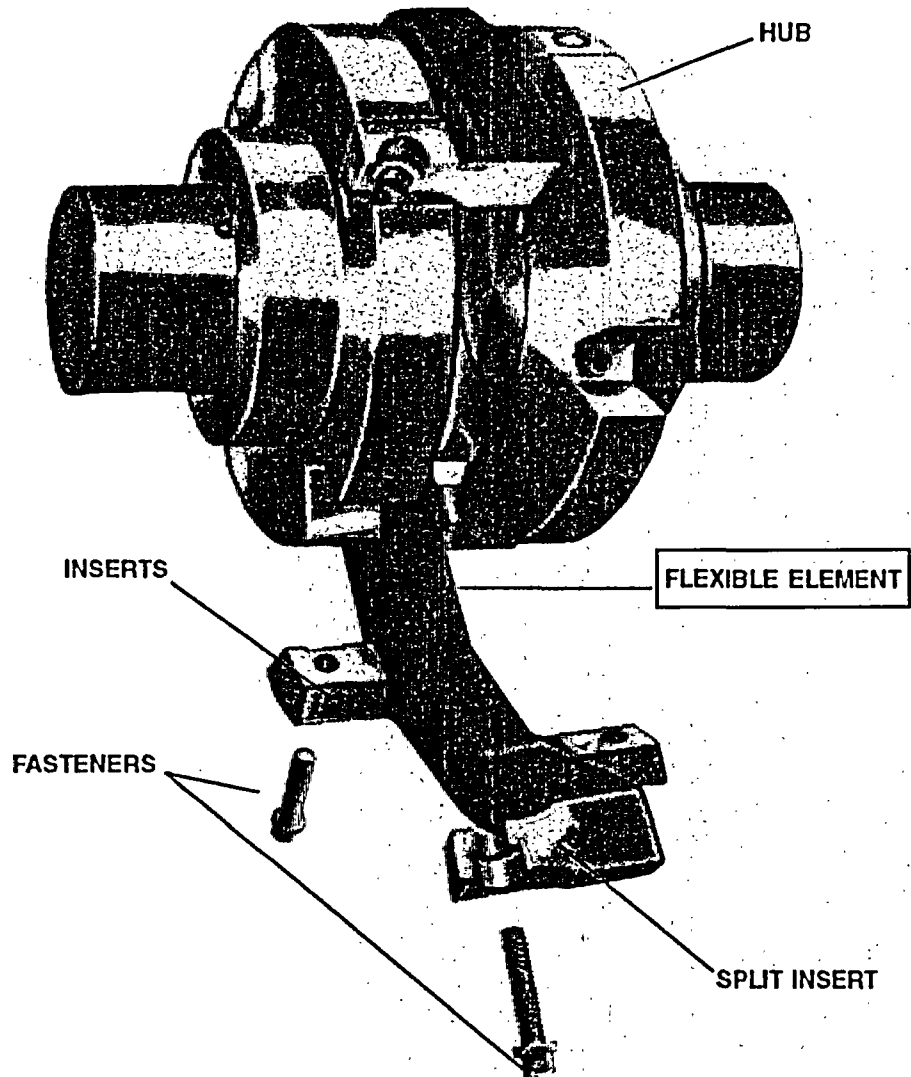
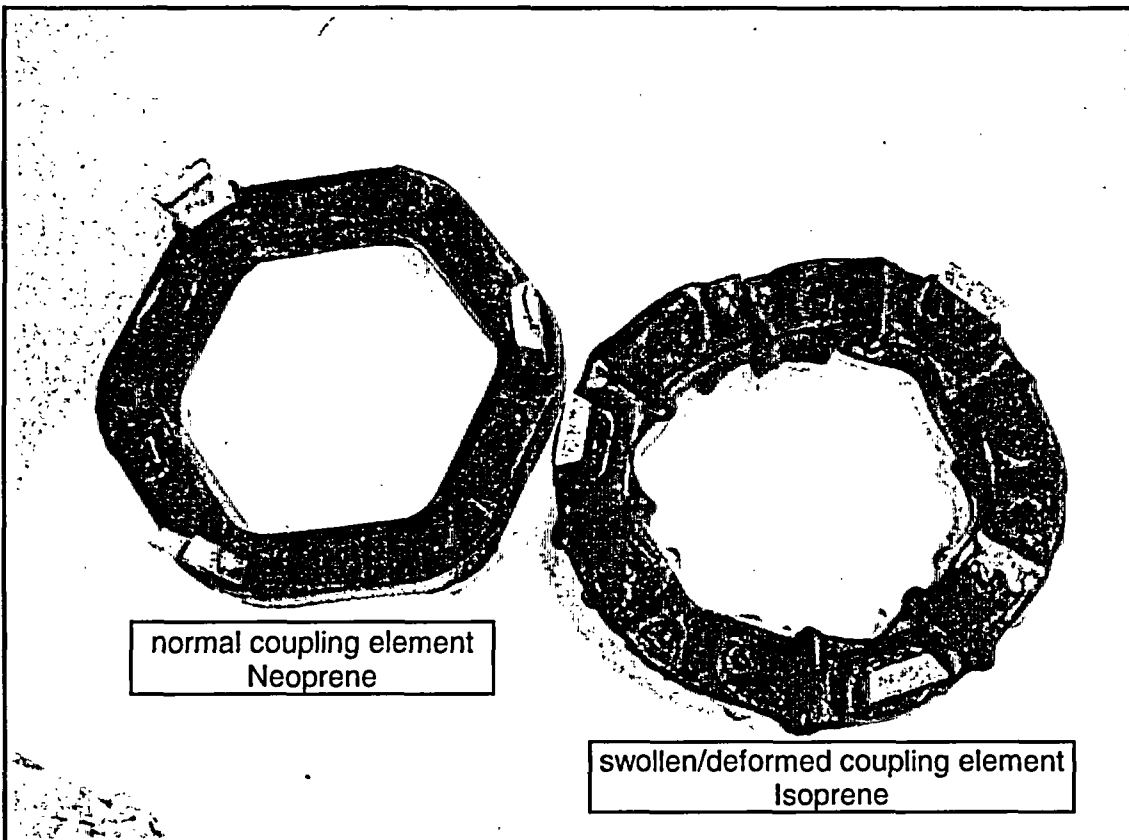


Figure 2: View of coupling assembly

In June 2005, the Shearon Harris plant had reportedly removed a coupling element from their diesel engine and observed the material to be swollen and deformed (see Figure 1 below). A subsequent technical report provided by the site's Materials Services Section found the material composition of the element to be isoprene (natural rubber). The current design of the coupling specifies the material to be polychloroprene (neoprene).



**FIGURE 1** A photograph of two governor couplings removed from an emergency diesel generator at the Harris Nuclear Plant. There are supposedly identical components that have been exposed to the same service environment. Note that the coupling on the right is swollen and deformed compared to the one on the left.

The results of ESI's internal investigation revealed that several utilities have been supplied coupling elements made from isoprene. The isoprene material is not suitable for the high temperature, oil rich environment of the engine gear case and is susceptible to failure after prolonged exposure (the condition reported at Shearon Harris was noted after being installed on the engine for 16 months).

## **DISCUSSION:**

In June 1982 a 10CFR part 21 report (Transamerica Delaval #112) was issued to address the original coupling element material. The original design material, isoprene, was not "suitable for use in the high-temperature, oil atmosphere encountered in the engine's gear case." After a review by Transamerica Delaval engineering and the manufacturer, Koppers, the material was changed to neoprene. A distinctive part number was implemented that specifies the material of the coupling as neoprene.

ESI specified the distinctive part number for the neoprene element when ordering the elements; however, the manufacturer's distributor substituted an off-the-shelf version of the component without ESI's approval. Neoprene material was identified as a critical characteristic as part of the ESI commercial grade dedication requirements; unfortunately, the FT-IR material test results for the isoprene elements were incorrectly matched to neoprene because of a poor quality neoprene sample spectra contained within the material test library.

ESI has performed an internal review of material test techniques, sample preparation and known library spectra to prevent reoccurrence of this incident. The following changes have been implemented:

- Added additional spectra to material test library to improve correlation with neoprene.
- Obtained a different crystal for the FT-IR material tester which provides a more developed spectrum when testing highly absorbent materials such as carbon black elastomers.

The impact of incorrect material determination on other components has been reviewed. The review has determined that this issue is limited to testing of neoprene. Neoprene represents a very small percentage of components supplied by ESI. The governor drive coupling element is the only application where neoprene is utilized in a dynamic application, utilizing the strength of the material to transmit torque. This notification is therefore limited to the subject governor drive coupling element.

**AFFECTED USERS:**

This notification is applicable to all users whom ESI has supplied coupling elements made from isoprene. These sites are listed in Table 1 below:

Customer	Site	Customer PO#	Qty	ESI Order#	Ship Date
Entergy	Grand Gulf	MPY21815	1	104035	Nov. 2002
Entergy	Grand Gulf	10067692	1	3000576	Oct. 2004
Entergy	River Bend	RBY21404	3	103645	Dec. 2002
Entergy	River Bend	10060953	3	3000394	Apr. 2004
First Energy	Perry	45128937	3	3000644	Sep. 2004
First Energy	Perry	45146755	3	3001144	Mar. 2005
Georgia Power	Vogtle	7063665	8	3000789	Jan. 2005
Progress Energy	Shearon Harris	00161970	3	115387	Jan. 2004
Progress Energy	Shearon Harris	00233939	2	3001542	Aug. 2005
TXU	Comanche Peak	S04248066S2	2	114997	Jan. 2004
TXU	Comanche Peak	S04527466S2	3	3000835	Nov. 2004

**Table 1: Affected Users**

**CONCLUSION:**

All affected users (identified in Table 1) should perform the following:

1. Review their inventory for suspect elements listed in Table 1. Any suspect elements should be removed from inventory and replaced.
2. Determine if suspect elements listed in Table 1 have been installed on the engine. ESI has not been able to determine an expected service life of isoprene coupling elements when exposed to the high temperature, oil rich environment of the engine gear case. Therefore, our recommendation is to replace any installed suspect elements as soon as possible.

ESI will provide replacement elements free of charge until December 31, 2005.