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**SELECTION OF LUBRICANT MATERIAL
FOR THE ROLLER CHAINS
OF THE AHM GRAPPLE DRIVE SYSTEM
FOR THE CRBRP**

DOE Research and Development Report

APPLIED TECHNOLOGY

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By

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ABSTRACT

Properties of Anderol 732 lubricating grease are evaluated to meet the design requirements for the Clinch River Breeder Reactor Plant (CRBRP) auxiliary handling machine (AHM) chain lubrication. Based on the evaluation made in this report, the material is recommended as a lubricant for the specified application. The material is to be applied by the chain manufacturer prior to installation in the AHM.

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1.0 COMPONENT DESCRIPTION

1.1 AHM ASSEMBLY

The auxiliary handling machine (AHM) is a single-barrel handling machine to be operated within the reactor containment building (RCB). The primary function of the AHM is to install and remove the in-vessel section of the in-vessel transfer machine (IVTM) in the reactor head before refueling operations. The AHM will also handle IVTM and fuel transfer port plugs and control rod drivelines, and it will support various maintenance activities whenever possible. When not in use, the machine is self-supporting at a storage pit located in the northeast quadrant of the building.

1.2 GRAPPLE ASSEMBLY

The grapple assembly is one of the major components of the AHM. The grapple assembly provides a means of lifting the components handled by the AHM into the hot wall section. The grappling mechanism consists of three finger-like projections that expand to interlock with the internal structure of the component being handled. Two chains raise and lower the grapple through the hot wall, and the differential movement of a third chain actuates the finger motion.

1.3 GRAPPLE DRIVE SYSTEM

The grapple drive system moves the grapple vertically, actuates the grapple fingers, and indicates the grapple and finger loads. The grapple chain drive mechanism consists of two hoist chains, each a 1-1/2-pitch double-strand E Series roller chain in parallel with a companion 3/4-pitch single-strand E Series roller chain for grapple application.

1.4 LUBRICATION MATERIAL

This report evaluates and recommends a lubrication material to meet the design application requirements of the two hoist chains and the grapple actuator chain used in the AHM grapple drive system.

2.0 DESIGN REQUIREMENTS

Component-related factors that must be considered in determining the lubrication requirements of the Rex Chainbelt roller chains of the AHM are outlined in Table 1. The following service-related factors are pertinent:

- Environment: Dry argon gas with the possibility of some sodium vapor at a temperature of 200°F maximum.
- The use factor is low--about 20 times per year.
- The chains are scheduled for maintenance every 5 years as part of a programmed cleaning procedure.
- Radiation of low magnitude: Total maximum estimated exposure of less than 10^5 rads in 5 years.
- A catch pan will be located on the grapple to minimize internal contamination caused by leakage or over lubrication.

Lubrication requirements for the chains must include the ID areas of both the rollers and the bushings. The lubrication material for the AHM must meet all design requirements consistent with economic considerations.

TABLE 1
ROLLER CHAINS DATA

	Hoist Roller Chains (2)	Grapple Roller Chain (1)
Rex chain number	120E-2	60E
Dimensions (in.)		
Pitch	1-1/2 with through-hardened pins riveted	3/4 with through-hardened pins riveted
Roller/bushing width	1	1/2
Roller/bushing diameter	0.875	0.469
Maximum load chain (lb)	20,000	1,200
Minimum ultimate strength (lb)	74,000	10,000
Material	Carbon steel	Carbon steel

3.0 MATERIAL EVALUATED

The lubrication material evaluated in this report, Anderol 732, is manufactured by Tenneca Chemicals, Inc., Nuodex Division, Piscataway, New Jersey.

4.0 DISCUSSION

Anderol 732, the lubricating grease evaluated in this report, is a synthetic ester fluid compounded with gelling agents. It is designed for use where the dripping and slinging characteristics of an oil cannot be tolerated. It is recommended as an effective penetrating lubricant for high-speed chains, cams, and gearing. Typical properties are outlined in Table 2.

TABLE 2
TYPICAL PROPERTIES OF ANDEROL 732 GREASE^a

Property/Test	Value/Observation
Temperature range (°F)	0 to 250
Color	Light amber
Consistency	Tacky semi-fluid
NLGI number	00
Dropping point (°F), ASTM D566	340
Evaporation (%), ASTM D972, 22 h at 212°F	<1
Specific gravity	0.093

^aAnderol Synthetic Lubricants, Piscataway, New Jersey.

5.0 RECOMMENDATIONS

Based on the evaluation presented in this report, the use of Anderol 732 for chain lubrication is recommended. The lubricant should be applied to the chain rollers and bushings including ID areas by Rex Chainbelt, Inc., before the rollers and bushings are installed in the AHM.

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