

MAINTENANCE INSTRUCTION

MAGNAFLUX INSPECTION CONNECTING RODS AND BASKET

APPLICATION: All 567 Series Engines

GENERAL DESCRIPTION

This instruction is one of a group of Magnaflux Instructions to aid our customers employing this type of inspection to parts of Electro-Motive equipment. It outlines the recommended equipment, preparation, procedure and inspection standard to be used in the Magnaflux or Magnaglo inspection of blade and fork connecting rod and basket used in the 567 series engines. It is intended as a basis to determine if these parts should be accepted for re-use (provided they are otherwise conditionally and dimensionally satisfactory) or rejected according to interpretations of indications resulting from the Magnaflux procedure.

These Maintenance Instructions are based on our knowledge of material standards in effect on our product during past years plus investigation of parts performance on various railroads. The Magnaflux method is a very searching inspection device and indiscriminate scrapping of parts showing Magnaflux indications without regard to their effect on part function may be very costly to the railroad. If doubt exists concerning the significance of a specific Magnaflux indication, the Railroad's Engineer of Tests should be consulted.

Magnaflux is the trade name of a magnetic particle inspection method developed by the Magnaflux Corporation for use on ferro-magnetic materials. Magnaglo is the trade name given a similar method of inspection where the magnetic inspection particles have a coating which gives them properties of fluorescence

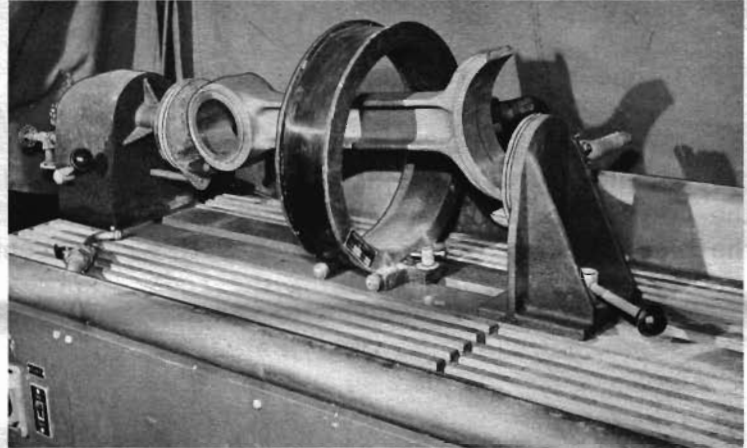


Fig. 1 - Blade Rod In Magnaflux Machine

under "black light." Details of these methods other than covering the application outlined in this instruction will not be amplified as full information concerning them and other **Magnaflux** procedures and equipment may be obtained direct from the Magnaflux Corporation or their representatives.

Equipment And Supplies

A Magnaflux unit of the KC type, capable of producing 500-600 amperes alternating current is recommended. This type of unit may be used in conjunction with an XRTL auxiliary unit or alone by making use of a cable wrapping. Gray Magnaflux powder or Magnaglo may be used. The powder may be applied by means of a powder blower or bulb type applicator. It is suggested that the Magnaflux Corporation or their representatives be consulted regarding equipment and supplies.

Preparation

Satisfactory Magnaflux inspection cannot be performed while the connecting

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rods are in the engine. After the removal from the engine, the connecting rods and baskets should be thoroughly washed to remove dirt, oil and grease. If powder is used, the surface must be dry to permit free movement of the magnetic particles.

Procedure

1. Connecting Rods

When an XRTL type of unit is employed, place the connecting rod inside the coil as indicated in Fig. 1, showing the blade rod in place. Another satisfactory method of magnetizing the rods

is to make three loops of cable as shown in Fig. 2, around the rod.

The fork portion of the fork rod should be magnetized by placing it within the field of the coil or loops to check for possible defects at bottom of the serrations. The coil or loop should also be placed over the slipper end of the blade rod.

Magnetize with 500-600 amperes alternating current. Apply the inspection material, Magnaflux or Magnaglo, either while the current is flowing or after the current is shut off. The parts will usually retain enough magnetism to permit re-

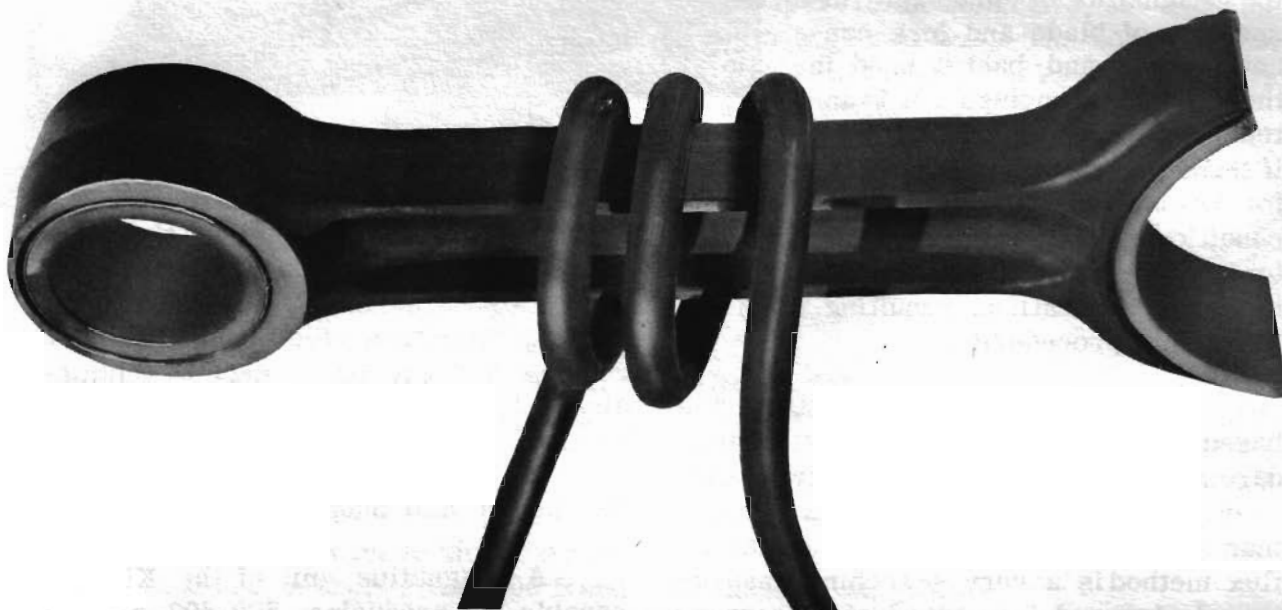


Fig. 2 - Cable Magnetizing Application

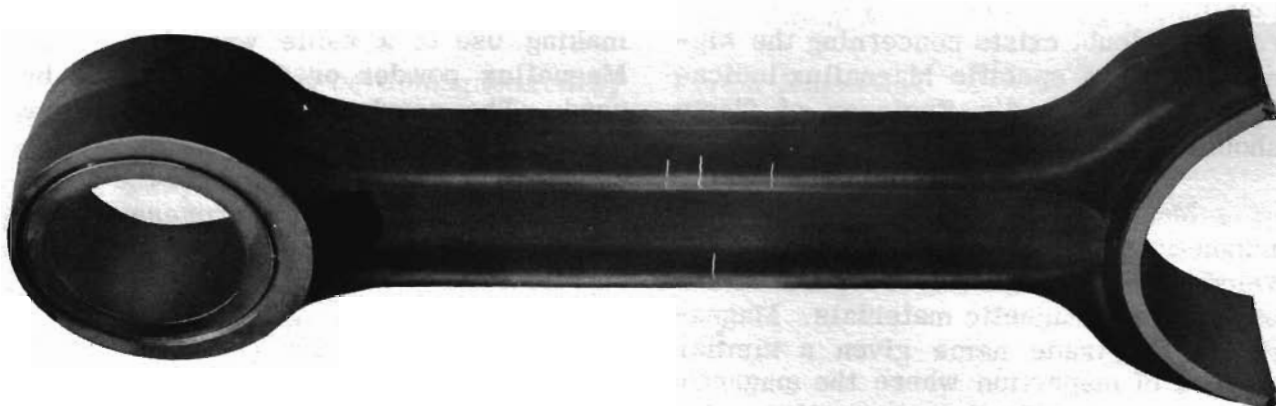


Fig. 3 - Connecting Rod Defect Indications

sidual inspection. Apply the powder sparingly so that minute indicators are not hidden.

2. Fork Rod Baskets

Although the fork rod basket is inspected separately from its mating connecting rod, care must be taken to be sure an acceptable basket is again matched to the mating rod. To aid in this identification, both the rod and its matching basket have the same serial number.

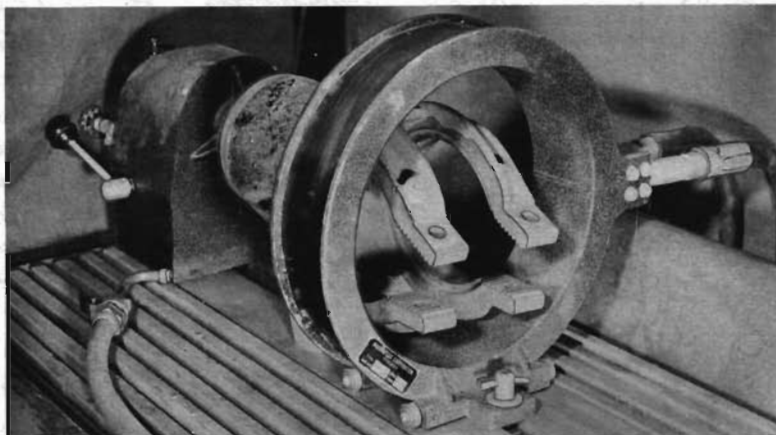


Fig. 4 - Position Of Rod Basket For Magnafluxing

Place the basket within the coil as shown in Fig. 4. When such a coil is not available, a suitable coil may be made by making three turns of #0000 flexible cable and connecting the ends to a portable magnetizing unit.

Magnetize with 500-600 amperes alternating current and apply the inspection material, Magnaflux or Magnaglo either while the current is flowing or after it has been turned off.

Inspection Standard

1. Connecting Rods

Fig. 3, shows Magnaflux indications of transverse defects in the rod flanges, using gray Magnaflux powder. Any defects in this direction and location reject the blade or fork rod, since they usually result in failure.

Sometimes due to bearing seizure, heat checks develop in the blade rod slipper face. Special attention should be paid to this area, since defects of this nature will probably result in failure. Therefore these indications are cause to reject the blade rod.

Detrimental defects in the fork rod are usually confined to the serration area. The indications will appear at the end of the serrations with their origin at the root or in the cap-screw hole. Further progression of such defects will probably result in failure. Accordingly these defects are cause to reject the rod.

Indications of longitudinal laps*, seams** or inclusions*** in the "I" beam section or similar indications on other areas of the connecting rod are usually considered harmless.

* Lap is defined as a surface discontinuity due in forgings to the hammering in of folds in the metal.

** Seams are defined as a discontinuity caused by a void or crack found in rolled material parallel to the axis of the material.

*** Inclusions are defined as particles of impurities, usually oxides, sulphides or silicates that are generally dispersed at random through all steel products.

2. Fork Rod Baskets

Failures of the fork connecting rod baskets are mostly due to loose cap-screws and are confined to the serrated ends. The "Procedure" for the baskets has therefore been aimed at disclosing cracks in these areas which may lead to ultimate engine failure. Fig. 5, shows an example of typical defect indications of fatigue cracks. Any baskets which show indications of cracks emanating from serrations or bolt holes should be rejected.

NOTE: In the event of rejection and scrapping of a fork rod basket, it also rejects its mating rod. The basket is fitted and line bored with

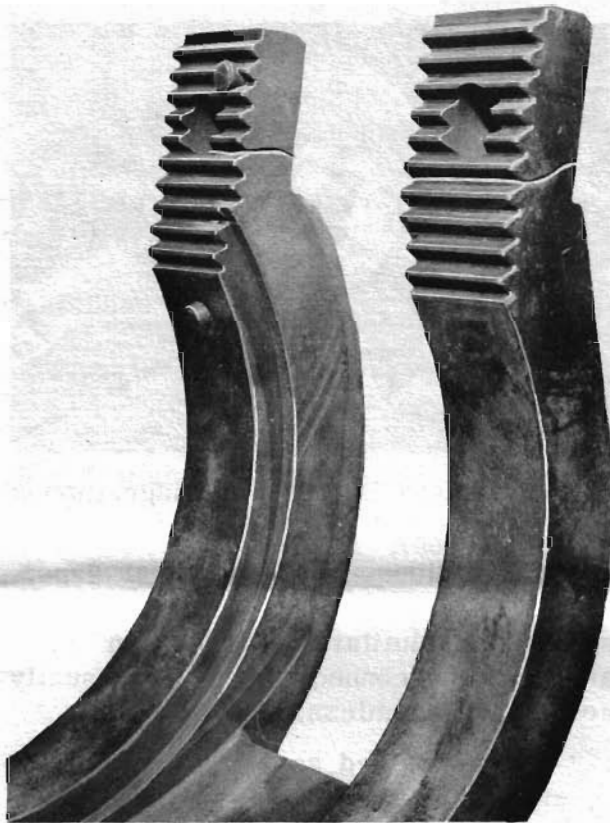


Fig. 5 - Example Of Fatigue Cracks

the rod having the same serial number as the basket and is therefore not interchangeable for use on other fork connecting rods.

Preparing Parts For Use

After Magnaflux inspection, the connecting rods and baskets should be freed of the inspection material and the fine metallic particles. This may be accomplished by demagnetization and thorough pressure washing of the parts.

The parts may be demagnetized by reducing the AC magnetizing current to approximately zero, or the part may be drawn away from the influence of the magnetizing field.

After demagnetization the parts should be washed by flushing and dried, and if being installed soon, oil protected. If considerable time will elapse before final installation, a suitable rust preventive should be used on the parts.

One method of providing rust protection is in the re-use of the VPI paper used for this purpose by our Parts Department on new parts shipments. By placing the parts in a closed space with VPI paper not more than 12" from all surfaces, they can be protected from rust for a considerable length of time. The parts may be placed in individual boxes having hinged lids with VPI paper stapled to the lid and bottom of the box. For VPI paper to be effective, it must be used in a closed box. The box does not have to be air tight, but VPI will not work in a box having the lid open.

Other Magnaflux Instructions

For convenience, other existing instructions pertaining to Magnaflux inspection are given here.

Exhaust Valve Zyglo Inspection	M.I. 2124
Piston Pin Carrier Magnaflux Inspection	M.I. 2125
Crankshaft Magnaflux Inspection	M.I. 2126
Cylinder Head Magnaflux Inspection	M.I. 2127
Piston Magnaflux Inspection	M.I. 2129
Piston Pin Magnaflux Inspection	M.I. 2130

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