Operation and maintenance of mixing equipment

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7.1 INSPECTION OF BANBURY MIXERS

The Banbury mixer is a rugged piece of equipment, manufactured to exacting specifications and tolerances, intended for maximum life and productivity. Service life will range from 2 years (for extremely abrasive compositions) up to 25 years (for soft compounds such as sponge rubber). As the mixer ages, the tips of the wings of the rotor become rounded, reducing the shear rate. In later stages, the hard surfacing of the chamber sides begins to wear, further reducing the shear rate as well as increasing the fill factor. Wear to the throat increases material sticking, and excess clearance reduces pressure on the compound. As overall wear increases, the batch size is usually increased and the cycle time is often extended. Invariably the quality of dispersion becomes adversely affected. The end of useful life is best determined by monitoring the quality of the compounds and production rates. Once quality starts to fall off, it will drop at an increasing rate because the wear resistance of the hard surface layer diminishes as the base metal is approached. When product quality first starts to drop, plans should be made for replacing the mixing chamber.

Scheduled preventive maintenance is vital to ensure operation with minimum downtime and expense, and maximum service life. And any variables that affect process control (rotor speed, rotor, body and door temperature, coolant flow rate and ram pressure) must be checked to make sure they correspond to instrumentation readings.

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Determination of the overall mechanical condition of the mixer, and estimation of when component replacement will be required, necessitate formal inspection at regular intervals (typically by the manufacturer's technologists). The objectives are as follows:

- To determine whether process control instrumentation remains accurate.
- To determine whether the lubrication program is adequate.
- To determine whether machine adjustments are indicated.
- To determine whether any components should be replaced.

The following components are inspected:

- rotors and bearings
- bearing and mixer lubrication systems
- side, rotor and doortop cooling systems
- dust stops and related lubrication
- drop door and latch
- hydraulic system
- gears and couplings
- Banbury hopper

Before starting the inspection, it is essential to complete the shutdown procedure specified in the instruction manual. Restarting for test purposes should be done under engineering supervision.

7.1.1 Inspection at the mezzanine level

Side cooling

The outside wall should be at the same temperature at both top and bottom zones; if there is a differential, a zone may be partially plugged. If flow rates are correct, the outlet pipes should run 6–10 °F higher than the inlets.

Rotor cooling

Like the side cooling, a 6–10 °F temperature rise is expected. If higher, check the flow rate. If very low, check the siphon pipes (if broken, high rotor temperatures and almost no temperature rise is found).

Rotors and bearings

After removal of grease and traces of compound from rotors in the dust stop sections, the mixer is started and rotor movement observed. Random vertical movement is an indication of bad bearings, bearing