



Whether new or old, mechanical power-transmission equipment needs...

...Planned Maintenance for A Longer Life Span

Belts

Smart maintenance transmission-wise shows up as a twofold dollar savings. These savings come in reduced power bills, when transmission losses are cut, and in lower operating cost when belt replacements are fewer.

V-Belts. There are several possible trouble sources here that you should watch for in your maintenance program: (1) too few belts on a single drive (2) sheave diameters too small for belt cross-section (see Power, Nov '52, p 112) (3) sheaves that have incorrect groove angle for specific belt (4) belts that run too fast... keep belt speed below 5000 fpm (5) belts of wrong construction used for a given application.

Tension is an important angle in V-belt maintenance. Ever play Crack-the-Whip as a kid? Chances are you ate supper off the mantle till you realized the tremendous snapping force a whipping action can produce. And if your

V-belt hasn't enough tension, you'll get the same snapping action. This will happen more often at peak loads or when starting the motor. Any extra slack is suddenly taken up, and the last section of V-belt to be whipped taut is jerked with a force far greater than it was designed to stand. This is the reason why a loose V-belt in service will stretch more than a tight one.

So don't be afraid to pull V-belts tight. Stretching them slightly is good for their general health. Check often for stretch and sag, especially during the break-in period. *A slack V-belt feels dead when you thump it with your hand, a properly taut V-belt has an alive springiness.*

And while you're thinking about tension, check sheave alignment occasionally. A straightedge will do, or in a pinch, a cord. Just stretch it across the sheave faces and see that it touches

all the four possible points of contact. **Leather Belts.** Here are a few maintenance tips regarding leather belts. First, standardize on as few belt widths and plies as economically meet plant requirements. This cuts down variety of spare belting that must be carried in stock. Belt should not slip or creep more than 2% of total belt length. Frictional heat, created by too loose a belt, burns and cracks belt surface.

Where excessive tension is needed to prevent belt slippage, substitute a wood or fiber pulley for the small steel one. Belt tension can be reduced by lagging small pulley with leather, rubber or duck.

Excess crown on a flat pulley may produce strains along belt center line and cause premature failure. Have pulley face $\frac{1}{4}$ to 2 in. wider than belt. Save transmitting power by checking that transmitting pulleys are in line.

Couplings

Proper alignment ranks well up on the flexible coupling maintenance list. Coupled shafts will transmit power at a higher efficiency where the shafts are perfectly in line. Flexible couplings are designed to compensate for unavoidable misalignment that creeps in after shafts are coupled. Bearing failures and shaft fatigue—because of alternate compression and tension of shaft's surface—result from excessive misalignment.

Another common trouble cause sprouts from selecting couplings too

small for the application. This usually results from not giving proper attention to load characteristics and the power unit. Centrifugal pumps and fans under normal conditions represent a fairly steady load and cause little coupling wear. A plunger pump, on the other hand, represents a load that varies with the position of pistons and is continually subjecting couplings to shocks. Consequently, the coupling selected for the latter application must be large enough to meet the more severe conditions.

Where couplings are to be used for reversing service, give extra thought to the type selected. For instance, don't use couplings with considerable backlash for such an application. If reversals are frequent, select a coupling large enough to stand the service. Where couplings are for use with braking action, as on cranes and hoists, take account of these conditions and use a proper service factor. Correct service factors are generally listed in manufacturers' catalogs or technical bulletins.

Planned Lubrication of Transmission Equipment

Years back, men who operated machines were often skilled mechanics who lubricated and maintained their own units. They may not have been lubrication experts, but they did have a single-minded interest in keeping them going.

New Ways. As industry became larger and more specialized, maintenance tended to separate from operation. And, unfortunately, lubrication too often drifted off into an independent chore that got little real attention from anybody. "Oiling" became a low-skill low-pay job with little incentive. Today, lubrication engineers, relative newcomers to the professional field, are stepping into the picture. They're making lubrication an organized, plant function that will pay off in longer machine life.

Organizing. Best way to tackle the job of modernizing lubrication practice in your plant is to think of it as a separate function in the maintenance setup—not as an odd job to be done in spare time. Approach varies, depending on whether the lube group is being set up in a new plant or an existing one.

Start Early. In a new plant, the lubrication engineer in charge should work closely with designers, keeping them on the beam as to operation and maintenance. In this way most-effective lubrication equipment can be installed at the start and the whole system coordinated for best working results.

In an existing plant, you'll have to move step by step, but goal is the same—efficient, economical lubrication.

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Chains

You'll find power-transmission chain in practically all kinds of power jobs. Its great strength permits transmitting large power with small cross section. And it can run in temperatures that would quickly destroy belts. It is made in many forms, but let's call our shots here and concentrate on finished-steel-roller designs. You can adopt much of the info to other chain drives.

Drive Position. On short- or normal-center drives, the slack side of the chain may be either on top or bottom. Slack strand runs better on the bottom, because a loose top strand tends to disengage the drive sprocket teeth. On long

centers, to prevent the strands rubbing together, have slack strand on bottom.

Avoid vertical drives where possible. But if you must use them, keep them fairly tight by frequent adjustment. You can reduce the care and adjustment needed if you install the drive slightly off vertical.

Alignment. Accurate alignment for any chain drive is an absolute must for trouble-free operation. Make the shafts, to which the drive connects, level and parallel, and the sprockets in line. You can check sprocket alignment with a string or straightedge held against their sides. As with belt pulleys, locate chain

sprockets as nearly as possible to shaft bearings. To avoid excessive vibration mount motors and shafting rigidly.

Don't run roller chains with both strands tight. For best results have center distance between sprockets adjustable, to take up slack caused by wear. There is no definite rule for tension in a chain drive. In horizontal and inclined drives, normal practice allows a sag (when running) equal to about 2% of the center distance between sprockets. This is more than that used on belt drives. But it works well. On loads that fluctuate badly, run chain tighter to reduce flopping when chain is moving.

Bearings

Bearings fall into two classes: *sliding contact* and *rolling contact*. The former are also known as plain bearings, while the latter may be ball, roller or needle bearings. Operating engineers have spent many years with the sliding-contact-type bearing for power-plant auxiliaries, and are generally quite familiar with good maintenance procedures. So let's skip over to the rolling contact variety and review some proved field-maintenance procedures.

While you don't need to handle rolling-contact bearings like antique china, they do need proper care. They're precision made and this precision must be kept throughout their useful life. When inspecting an old bearing, look for excessive hardened areas. Streaks or spots are the giveaway. Check for

cracked parts; etching resulting from contact with acid, discolored areas caused by overheating. Any of these should cause rejection. For a complete picture story on why ball bearings fail, see Power, May 1951, p 116.

Bearing removal can best be done with a set of bearing pullers. They look and work like gear pullers. Apply pulling force on the inner ring that hugs the shaft. Don't tug on the outer race. Putting the bearings back on usually calls for a press and a pipe sleeve. After lining up the bearing, select a sleeve the diameter of the inner race. Put this sleeve between the inner race and the press. Apply even pressure and she'll slide home.

But installing some bearings may be tough work. It may call for heating

the bearing in hot oil, and using special equipment to raise and lower it. Heating inner race to between 200 and 250 F gives a good shrink fit. Sometimes it's more convenient to use dry ice and shrink the shaft. This allows the bearing to slide easily onto the shaft.

We Slipped . . . a little

Some copies of the December issue were off the press when a typographical error on p 132 was spotted. In the second paragraph of the short article, "High-Temperature Greases Let Motor Run at 150 C," the equivalent of 150 C was listed as 202 F. It should have been 302 F.