HALE FIRE PUMP COMPANY
CONSHOHOCKEN, PA. • PHONE: (215) 828-8835

SERVICE BULLETIN #7

April 22, 1965

TO: All Major Pump Service Personnel
Major Pump Customers

SUBJECT: Typical Drive Unit Complaint - Drive Shaft Vibration

A typical complaint and solution on midship pump noises, to which we referred in our Service Bulletin #6, could be the following which actually occurred.

One of our Major Pump Customers complained to us about vibrations in the drive unit of a new midship pump he had installed in a truck. They were especially concerned about this truck because it was going to a nearby community where they hoped to use it as a "demonstrator".

When our service personnel arrived at our customer's plant, they found a second truck, which was being serviced, also had a similar complaint. The second truck had been built in 1960 with a new midship pump.

Both trucks were Chevrolet 80's with relatively small high-speed V-8 engines (348 cu.in.) and two speed rears. The severe vibration in the new truck was discovered in a routine road test driving in low range (9.77 differential ratio) at 45 MPH (which corresponds to approximately 4000 RPM drive line speed). The governor was set at 4400 RPM.

A preliminary examination revealed that the pump on the new truck appeared to be mounted in the correct angle. The fork alignment on the drive lines also appeared to be O.K.

To check out the source of the vibration, the truck rear was jacked up under the axle housing and the following checks made:

(a) The truck engine was run in "road" - vibration was very rough, starting at about 3000 RPM and hitting a peak at about 4000 RPM.

This check served to confirm the road test findings.

(b) The engine was then run with the pump gear box in "neutral" - vibration was still rough but did not seem as bad as in "road".

With the pump in the "neutral" position the rear drive line does not operate. This proved that there were vibrations between the "neutral" pump gear and the truck transmission. The decrease in the amount of vibration indicated there had to be some vibration between the "neutral" gears and the differential.

(c) Next, the front drive line was dropped - the engine and truck transmission ran smoothly all the way to 4400 RPM.

This step ruled out the engine and transmission as a source of the vibration trouble.

(d) The front drive line was put back on and rotated 90° before connecting the front flanges - this time it ran smoothly in pump "neutral"; however it still ran rough in "road".

Our service people have now corrected the vibration through the pump drive "neutral" operation.

(e) The rear drive line was disconnected and the pump transmission run in "pump" road position - there were no vibrations.

With this step the Hale midship pump drive unit was finally eliminated as a source of their particular vibration problem.

(f) When the rear drive was put back on, it was also rotated 90° before connecting the flanges - vibration continued in the engine "drive" position.

The 90° rotation did not solve the problem on the rear drive as it had on the front drive.

(g) The rear drive was again rotated 90° with no change in the vibrations. A third 90° change had no effect.

With changes in position of the drive ruled out, other solutions had to be sought.

(h) A check on the eccentricity of the rear line drive revealed that it only had a maximum run-out of .008". The drive line was 66" long (about 1 ft. longer than the front) and had Spicer joints. It did not have any balancing weights in it.

This check is fairly easy to do and might have been made before others involving a greater amount of labor.

(i) Another drive line with Mechanics joints was placed on the rear - vibration was worse than with the original drive line.

With this check our service men concluded there was something wrong with the drive lines that required specialized investigation.

A similar procedure was next followed on the second truck with similar results.

The rear drive line from the new truck was returned to Conshohocken by our personnel. It was then checked out by a drive line specialty shop who found the fork alignment and run-out to be O.K. When it was then dynamically balanced, it was found to be out 4-1/2 inch-ounces at the drive end and 2 inch-ounces at the differential end. It was interesting to find that the unbalance force (4-1/2 inch-ounces) calculated to be at least 130 pounds at 4000 RPM.

The correctly balanced assembly was returned to our customer. When installed they found a big improvement - but there still was some slight vibration. Next they rotated the flange bolted to the pump brake drum 90° - finally there were no more vibrations. Road tests in low range confirmed their final findings.

Our customer had the rear drive from the second truck dynamically balanced and, as far as we know, received similar satisfactory elimination of the vibrations.

We hardly need to point out that any time a shaft is cut, the remaining sections should be balanced. This should be done even if the original shaft had been correctly balanced, since you may have removed the shaft section that caused the full length to have proper balance.

Correct drive line ~~blance~~ balance is especially important on light weight chassis with high engine speeds and two speed rears.

This is just one typical complaint and one solution with our explanations. The material covered in our Service Bulletin No. 6 points out other problems and suggests solutions to them. Extra copies of the bulletin and enclosures are still available.

At Hale we strive not only to build the "best" fire pumps but also to insure that they give the "best" operation on your equipment.

Very truly yours,
HALE FIRE PUMP COMPANY

"Skip" Shaffer

C.R. "Skip" Shaffer
Service Manager

## E.M. GOVERNOR / DIESEL ENGINE

### CUMMINS DIESEL

The Cummins Diesels being supplied to truck builders are normally equipped with the automotive-type (maximum speed) governor; the foot throttle is attached to this governor. The throttle shaft position in this governor determines the engine speed between idle and maximum for "over the road operation". Where a constant speed control is necessary, such as pumping operations which require close engine speed control, it is necessary to use an auxiliary governor which is referred to as the MVS (Mechanical Variable Speed) Governor in conjunction with the automotive-type. It has been our experience that for the best "Engine Master" controlled pumping operation both the automotive-type and the MVS governors should be installed. These should be set up so that for "over the road" operation the engine speed is controlled by the foot throttle attached to the control arm of the automotive-type governor, while the MVS governor is in "full open" position. For pumping operation the reverse set-up is used, i.e. the engine speed is controlled by the E.M.Governor attached to the control arm of the MVS by means of the E.M.Governor cable, while the automotive-type governor is in the "full open" position. The opening of one governor and engaging of the other can be accomplished by air operated power cylinders (or by hand throttle controls). If the air operated cylinders are used, and pump is equipped with the air operated pump power shift, the change from actuating one governor to the other can be made simultaneously with the Road to Pump air shifting.

The control arm of the MVS governor (to which E.M.Governor cable is attached) should be of sufficient length for the cable to be selectively attached (various locations from fulcrum) to utilize full travel of the E.M.Governor (in relation to MVS Governor travel). The E.M.Governor cable installation must be as covered in Hale's "Installation Instructions", so there is no binding or lost motion.

NOTE: When MVS Governor has been added to an existing engine it may require recalibration of the fuel pump by the Cummins representative.

### DETROIT DIESEL

The Detroit Diesel engine supplied to truck builder will normally be equipped with the correct type of "Limiting Speed" mechanical governor. To ascertain that the correct type governor has been supplied, it can be identified by a tag attached to side of governor; the letters DW-LS means double weight-limiting speed and any other type governor on the Detroit Diesel will not work with the Hale E.M.Governor.

The control arm of the "Limiting Speed" Governor (which the E.M.Governor cable is attached to) should be of sufficient length for the cable to be selectively attached (various locations from fulcrum) to utilize full travel of the E.M.Governor (in relation to limiting speed governor travel). The E.M.Governor cable installation must be as covered in Hale's "Installation Instructions" so there is no binding or lost motion.