Section 19

WILCOX-RICH HYDRAULIC LIFTERS

SERVICE INSTRUCTIONS

THINGS TO BE REMEMBERED IN HANDLING:

1. Plungers not interchangeable:

The plunger in the hydraulic unit is not interchangeable in the cylinder as tests are made after assembly for the rate of leak-down, which determines the quality of the unit rather than diametric clearances.

2. Plunger spring must be snapped in counterbore:

Any time the plunger is removed from the bore and replaced, the plunger spring should be snapped into the counterbore of the hydraulic cylinder. This can readily be done by a slight twisting motion in the direction to wind up the coil of the spring.

3. No grinding or machining to be done on unit:

It is not advisable to do any kind of grinding or machining on the hydraulic units. In cases where valves have been re-seated to a depth which would require increasing their mechanical clearance, the valve stems should be ground off to provide this clearance.

4. Shellac or gasket cement not to be used:

No shellac or gasket cement of any kind should be used at any point where it will be possible for it to get into the hydraulic lifters, as this will cause the check-ball to be glued to the seat and prevent operation.

ESSENTIALS OF OPERATION:

1. Body free in guide:

The tappet body, itself, must be a free fit in the guide. A proper test for this is to insure that the tappet will drop of its own weight in the guide.

2. Check-ball must not leak:

The check-ball must not leak more than about one drop per second when filled with kerosene, and the plunger loaded with 50 lbs. pressure.

3. Check-ball travel must not be too great:

The check-ball should not have more than .014" travel. This is provided for in manufacturing and it would be very seldom the travel would exceed this amount.

4. Plunger must be free in bore:

The plunger must be a free fit in the hydraulic cylinder and, at the same time, the leakdown rate must be right. The production limit is ¼" travel with 50 lbs. load in not less than four seconds when unit is filled with kerosene.

Fixtures are available for service inspection which compare a unit to be tested with a master unit. As there are a number of these fixtures, the method of testing is not given here, therefore reference should be made to the instructions provided with each fixture.

5. Lifters must have proper mechanical clearance:

The mechanical clearance should be checked each time installation is made. This check should be made without oil in the unit.

6. Proper oil supply must be maintained:

Oil must be supplied to the hydraulic lifters with at least three or four pounds of pressure at idle and twenty pounds of pressure at high speeds; and the maximum oil pressure should not exceed fifty-five pounds for any great period of time, as excessive oil pressure can cause the entire hydraulic unit to pump up and down in the body, preventing compensation, resulting in noise.

HANDLING:

The usual handling will be: Removal for valve grind or some other repair or replacement, in which case it is only necessary to wash-up the hydraulic lifters, removing the plunger from the hydraulic cylinders one at a time to prevent interchanging, washing them thoroughly in clean gasoline, kerosene, or any cleaning solution used for other parts and replacing them in the engine without any attempt being made to fill them with oil before assembly. After assembly, check clearance using a screwdriver to pry the plunger down. With valve in closed position, measure the clearance between the end of the plunger and the valve stem. Running the engine, the units should quiet themselves usually within forty-five minutes in a horizontal engine. The time required for any

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given unit to quiet is not indicative of the quality but means only that the particular unit has a larger amount of air to dispose of.

The engine should be run at the lowest speed which produces maximum oil pressure, until all lifters have become quiet.

It often happens that when a hydraulic unit is operated in an engine for a considerable length of time, carbon may form on the inside of the cylinder above travel of the plunger during normal operation. If this takes place, the plunger will appear to be stuck in the cylinder. The following is the condition which actually occurs in this case:

Removal of the valve stem from the top of the plunger allows the plunger to move upwards and the hydraulic unit completely fills with oil. The carbon which has formed on the inside of cylinder above the shoulder on the plunger makes removal of the plunger very difficult and, since the unit has filled with oil, the plunger cannot be forced down because the oil is trapped by the check ball. This gives the impression of a stuck unit and, in order to free the plunger, the following can be applied:

Press the plunger all the way down while holding the check valve off its seat with a matchstick or other blunt instrument. This will allow the oil to escape and permit the unit to be checked with the leakdown tester. In most cases the carbon which has formed above the plunger can usually be broken by twisting the plunger and pulling outward at the same time. In case the carbon buildup is quite great and cannot be removed easily, it is advisable to place the unit in a solution which will dissolve the carbon ring. Once the plunger has been removed any carbon remaining on the cylinder should be cleaned off with a rough rag. The cylinder and the plunger should then be washed thoroughly before reassembling.

In replacing the plunger into the cylinder, give it a twist, while it is fully depressed; this will cause the end of the spring to snap into its seat.

TYPES OF FAILURE:

With respect to failure of hydraulic lifters, there are four general classifications:

1. Where very slight single or multiple noise is heard.
2. Where a single loud noise will be heard.
3. Where there is general noise in the entire set.
4. Intermittent or general noise in any particular section of the engine.

1. Slight Noise:

In the case of item 1, there is a variety of things other than the hydraulic lifter which can cause the trouble; such as, excessive clearance between the valve stem and the guide, eccentricity of the valve seat or anything which can cause the valve to contact the seat in closing at a point materially above the point where the valve sets on the seat.

In cases where this type of noise is made by the unit itself, it is due either to a leaky check valve or a plunger having too much clearance in the bore.

2. Loud Noise:

With reference to item 2 where single loud noise is heard in the valve gear: It is generally found that for some reason a hydraulic plunger has become sticky or tight in the bore to such an extent that the plunger spring will not move the plunger in the bore. This results in the plunger being forced all the way down so that the bottom of the plunger contacts the ball cage and the tappet clearance is approximately $\frac{1}{16}$".

The particular tappet causing the trouble can be located in the following manner: By using some kind of a listening rod and comparing the noise in each cylinder, it can readily be determined which cylinder the noisy tappet is in. Very often by listening directly over the exhaust or the intake, the individual tappet can be determined before disassembly. In any case, removal of these two tappets and examination will disclose which one has been sticking.

It will be found that the seating of the valve where a hydraulic unit is stuck produces a very perceptible shock to the valve spring at the instant of seating. This can readily be determined by either touch or sound. One readily accessible method is to push the end of a hammer handle against the valve spring keeper. If the tappet is noisy, a decided shock will be felt at the instant of closing. Whereas when the lifter is working properly there will be almost no shock felt. Once this comparison is made, there will be no question about its finality thereafter.

If it is found that one unit has a tendency to stick due to oil varnish, it is very likely that all units may need immediate attention to prevent a recurrence of sticking.

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3. General Noise:

In cases of general noise in the entire set (item 3), it is a definite indication that insufficient oil is being delivered to the hydraulic units. As a general rule, in cases where engines run out of oil the hydraulic units will provide a warning before serious damage is done as air will periodically be taken into the intake side of the pump as soon as the level is very low. This, however, is not recommended as a means for determining when oil is needed in the engine. In any case where general noise is observed, it is advisable to determine oil pressures at the hydraulic lifters.

4. Intermittent or General Noise:

In the case of item 4, the general or intermittent noise in any particular section of the engine is usually an indication that air separation is inadequate at this point. This type of noise will usually occur when the engine is brought down to idle from high speed, or possibly in some cases on starting. This is usually a question of design and is not often encountered in the field.

However, there have been some examples of individual engines where some air-leak occurred on the intake side of the oil pump, providing excessive aeration, so that the air separation provided in the job may not be adequate — either for all or part of the engine. In any case, if this trouble should be found, the inlet side of the pump should first be examined for air leaks — particularly as excessive aeration is apt to cause trouble in bearings or other parts of the engine. If no air leak is found, any arrangement which will increase the capacity for air separation may remedy the trouble.

In some cases it has been found that the valves were definitely being held open, causing defective performance; but this has been found to be something other than the hydraulic lifters themselves — generally a camshaft with sufficient runout on the base circle of the cams to crack the valves off the seat when they should be closed. The maximum allowable runout on the base circle of a cam used with hydraulic lifters is .002″ total indicator reading. It is not likely that many cases of this condition would be found.

5. To Summarize:

Noisy operation of hydraulic lifters is likely to result from inadequate oil supply, dirt, or air in the oil, etc., as outlined above and usually is not caused by any structural failure of the hydraulic unit itself.

Remember that no adjustment is necessary or possible on hydraulic lifters and that they are designed as a sturdy part of the engine to give long and trouble-free service — provided they are correctly handled and provided they are supplied with clean oil at the correct pressure. Therefore, it is advisable to leave them alone unless noisy operation is due to one of the causes mentioned above.