

DI SASSEMBLY

During the four parts of the video (Disassembly, cleaning, inspection and assembly) we guide you step by step on the head reconditioning process. Our goal is to rebuild the head to a "like new" conditions.

The first step is a visual inspection. During the visual inspection you should look for apparent damage. If you find any, you have to diagnose the severity of it, and if possible, solve the problem.

For Clean Burn heads, the next step is to disassemble the pre-combustion chamber.

You start by removing the cap and the gasket as you can see in this scene.

The next step is removing the retainer. Sometimes if either the retainer or the cap is difficult to extract, it is possible to use heat to loosen the components. The use of heat should be moderate in order to prevent damage of the parts.

Finally you remove the nozzle.

If the nozzle is in good shape it can be reused. In this scene you can see a new nozzle on the left and a defective nozzle on the right. Note the nozzle on the right. The ceramic coating is damaged. EnDyn recommends replacing the nozzle at each head-rebuilding interval.

Once you disassemble the pre-combustion chamber, you have to inspect the seat and threaded area.

If the threads are in bad condition (as the one on screen), depending on the severity of the damage, it can be repaired. EnDyn does not accept heads that require casting repairs into the exchange head program.

If the pre-combustion chamber is in good shape, then you have to clean the threads using a tap.

In this scene you can see the results of the cleaned threads.

The next step is removing the keepers, retainers, springs and valves. The wear is very unique for each pair of keepers, so if they are going to be reused, it is very important to keep them as a set. This will eliminate the possibility that one of the keepers is supporting more pressure than the other.

If the keepers are going to be reused it is very important to inspect that they are in good condition. You can see two sets of keepers. The set on the left are new. The set on the right are worn. EnDyn recommends replacing the keepers at each head-rebuilding interval.

You have to be careful reusing the retainers as well. Here you see two pair of retainers. The new ones on the left and the worn on the right. Note the excessive wear pattern.

Inspect the valve, seats and the combustion chamber for excessive oil, carbon, and

coolant deposits. It could be an indication of improper lube oil, excessive valve stem to guide clearance, liquids in the fuel gas or cracked cylinder head.

Inspect the springs for pitting and excessive wear at the end of the coils. Check freestanding height (Review the technical bulletins or the tolerance table for the correct dimensions).

An alternate method of testing the springs is with a spring compression tester. If the spring data is available this method is more accurate. (Spring data is available from EnDyn's Technical Service Department).

Next step is to magnaflux for possible cracks. If cracks are found, it is possible to repair the head, but this is not recommended. It is important to note that cylinder heads with cracks are not accepted in the exchange program.

To remove the seats, you grind the outside diameter of an old valve.

Next, spot-weld the old valve to the inside diameter of the seat.

Then you extract the seats by pressing the welded valves.

Next, the guides should be removed by using a special insertion/removal tool. Just like the seats, the guides should be pressed out.

The 1/4" plugs should be replaced during the rebuild.

CLEANING

The head casting and components should be placed into a hot caustic vat for six to eight hours depending on the overall condition of the head. This will allow ample time for removal of all carbon and scale from the combustion chamber and internal passages.

You should clean each part with steam. You have to be sure the internal passages of the head are cleaned.

Finally you blow-dry the head to prevent rust.

After cleaning the head, it is very important to inspect it for possible leaks. For this you seal the water passages and fill them with water. Apply a pressure of 60 psig. You hold the pressure for thirty minutes. Any drop in the pressure is a sign of leaks. If a head is suspected of leaking when in operation on the engine and a leak was not detected during the 30 minutes pressure test, heat may have to be applied to the head while maintaining pressure.

You have to be very careful with the plugs, as can be seen here.

INSPECTION

The first thing to inspect is the combustion chamber surface for excessive pitting or abnormal wear in the fire ring seating area. If excessive wear is found, it may require machining. You have to be careful not to remove more than 1/16" of metal from the surface of the combustion chamber; to assure this we can measure the thickness of the head to verify it is not below the minimum allowed (this dimensions can be found in the bulletins or in the tolerances table)

If machining of the combustion chamber is required, you have to machine the bottom of the head surface in order to maintain proper depth (you can review the correct dimensions in the tolerances table or in the technical bulletin)

Also, if machining of the combustion chamber is required, it will be necessary to machine the bottom surface of the seat (see the technical bulletin or the tolerances table for further information)

Inspect the internal diameters and the depth of the seat counterbores and fuel valve, verify they are within limits (see the bulletins or the table for detailed information). If machining is needed, you must maintain concentricity with the guides (see table or bulletin for tolerances) Oversized seats are available.

You also have to check that the internal diameter of the guide (check bulletin or table for detailed information) Oversized guides are available (Refer to Product Bulletin #114 for details).

You should check the surface where the springs seat. Wear, like the one shown here, can affect the performance, because it affects the tension of the springs. Depending on the magnitude of the wear, an insert may be required (refer to Technical Bulletin #1034 for further information).

If you need to place an insert, first machine the head surface.

After machining the head and with the guide installed, we place the insert in position.

EnDyn has inserts available in-stock (P-907-467). You can see how the springs fit on the inserts avoiding loss of tension during the operation. Heads that need inserts should be stamped with "use insert"

Finally, inspect jacket water port gasket surfaces for excessive pitting and cavitation.

If required, remove the pitted metal with grinder, build-up with a ni-cast rod, and machine or mill to a smooth surface finish.

ASSEMBLY

The valve guides and the seats should be frozen before installation. You do this because we want to shrink the guide in order to make it easier to install. If the

parts are not frozen, there is a chance that during the installation you could create cracks or deterioration of the casting.

The insertion of the guides should be made with a mandrel or a special tool as seen here.

Guides should be installed before the seats. You should take one guide at a time from the freezer. It is recommended that clearance be left between the guide flange and the cylinder head. This will eliminate the possibility of distortion of the internal diameter of the guide. This space should be between .005" and .010"

It is a common practice to ream all guides to assure the finished dimension is obtained (refer to the bulletins or the table for further information).

The reaming should be in both directions.

The seats should be frozen before installation. For this installation you have to use a special mandrel or an old valve in good condition. It is important to clean the debris between the contact surfaces to prevent damage to the parts, ensure that seat makes full contact with the head surface. The stem of the mandrel should fit the guide and will act as a pilot.

The next step is grinding the seats. For this you need to paint the border of the seat with a black marker. This will ensure the grinding is uniform. The grinding stone is piloted from the guide.

After grinding, you should look for marks not removed by the grinder. Obviously, if you find this, it means that the grinding was not uniform and that you would have to repeat this step.

Each one of the valves should be lapped to the seat. For this, use a good lapping compound such as Clover, grade E.

The lapping should be applied until we get 100% contact between the valve and the seat (this is approximately 1/4" of the width of the circumference of the valve).

Here you can see the results of lapping. Note the uniform line approximately 1/4" wide on both, the valve and the seat.

After lapping, it is very important to clean the parts and remove all of the lapping compound. If this is not done, the compound and other debris can cause premature wear of the parts.

The next step is to lubricate the valves and put them into position. The remaining parts of the assembly should be cleaned and lightly lubricated.

It is recommended that stress relieved springs (as the one on the right side of the screen) be used. They can be identified by the appearance of the cut off coil. Non-relieved springs have a blue discolored region, as the one shown on screen.
Non-stress

relieved springs are more likely to fail.

Each spring has a tighter coil on one end. You have to make sure that this end of the spring goes against the cylinder head. It is important to install the O-Ring on the intake valve. This will help to reduce oil consumption and excessive carbon build-up.

The O-Ring should not be installed on the exhaust valve. Finally it is extremely important to install the keepers in sets as they were removed from the head. This will avoid the problem of one keeper taking more pressure than the other.

After assembly, it is possible to perform a vacuum pump test to verify a positive valve seal. Finally we paint and apply a preservative to the head.

It is recommended that you properly mark the head with a serial number and the date to indicate when the head was rebuilt. It is important to remember proper installation and maintenance. For this purpose you can refer to the Technical Bulletins number 1007 (for maintenance issues) and 1033 (for torquing procedures)