

Design and manufacturing of a Handy Press for Bush Fitting using double acting hydraulic cylinder

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Abstract - We are designing the handy press for fitting bush into the bore of machine parts (D40 Powerroc) for an Industry. As organization is facing problem during assembly. As company was ordering this bush fitted parts from the vendor. Vendors are manipulating the bore diameters. So we are designing hand-held press for fitting these bushes in bore hydraulically. This will reduce time required currently for fitting bush and will also reduce accidents during hammering of bush into bush. It will also reduce the cost involved in defective bushes.

Key Words: Handy Press, Hydraulic Cylinder, Bush

1. INTRODUCTION

Organization asked us to survey the assembly line of PowerROC D40. During this survey we found out that most of times problem takes place in assembly of boom. i.e. loose fitting of bush in boom, boom head, boom pedestal, straight link during assembly.

Problem is caused by vendor is noticed by organization then organization started fitting this bushes in house, online by hammering the bushes into bore. As this process is time consuming and unsafe for workers and out of ten bushes three bushes are either cracked or break during hammering per boom assembly. In order to reduce this breakage of bushes and reduce time of assembly we came with a small portable hydraulic hand-held press.

A bush is a mechanical fixing between two, possibly moving, parts, or a strengthened fixing point where one mechanical assembly is attached to another. In a car or other vehicle's suspension, bushes are used to connect the various moving arms and pivot points to the chassis and other parts of the suspension

2. PowerROC D40

PowerROC D40 is intended for construction operations, aggregate, limestone quarries and open pit mining. The main components are

1. Crawler type, 2 speed undercarriage with track oscillation system .
2. Hydraulic chain operated feed system mounted in a steel feed beam .
3. Atlas Copco XAVS600 drill expert compressor with Cummins turbocharged engine.
4. Carousel type tube handling system .
5. Break out table .
6. Operator's cabin, ROPS and FOPS approved with rubber vibration dampers .
7. Hydraulically operated rotary head .
8. Single section boom system.
9. Complete dust collection system (DCT 140) including filter unit.

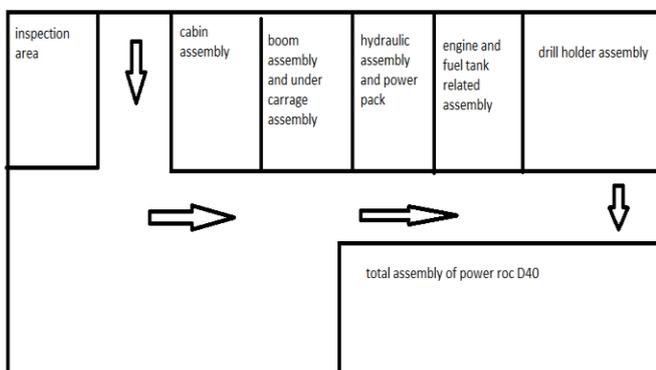


Fig 1: Assembly Line of PowerROC D40



Fig.1 : PowerROC D40

The new PowerROC D40 is found in the philosophy of giving the end-user a reliable drill rig that performs at high uptimes with simplicity in mind. The large compressor, efficient fuel regulation system, high rotation torque and rotary head gives an overall high productivity. Convenient and ergonomically grouped operator controls together with good tramming speed, provide for ease of operation and mobility

PowerROC D40 comes with an ability to drill at different angles and is equipped with the proven and efficient Atlas Copco single stage screw compressor pack, a powerful high torque HRH rotation unit and well-designed operators cab. A well-balanced design and compact transport dimensions make the rig movement smooth and transport from site-to-site easy. PowerROC D40 is equipped with an onboard XAVS 600 compressor which delivers 225 l/s (480 cfm), up to 14 bar of air pressure for high penetration and strong flushing. It provides straighter and cleaner holes compared to the pneumatic methods. It is also equipped with an adjustable air flow switch that enables the operator to regulate the flushing air volume from the cabin to help maintain hole quality. The highlight of PowerROC D40 is an effective fuel regulation system which helps moderate the engine governing and compressor flow.

The PowerROC D40 has a very good terrain maneuverability. The well-balanced and sturdy frame with 432 mm (17") of ground clearance enables efficient drilling even in rough terrain. Excellent trimming enables quick and safe transportation onsite and between work sites. Reduced hoses, valves and manifolds fitted on the rig minimize and simplify maintenance. A streamlined electrical system and pilot control hydraulics are easy to maintain. For good access to service points there are full length, hinged, doors on both sides of the rig

3. Methodology

1. Operation in various drilling applications: vertical bench, angle drilling, horizontal toe-holes near to ground.
2. High productivity in various rock conditions using down-the-hole hammers (DTH).
3. Powerful Atlas Copco XAVS 600, 14 bar screw compressor, suitable for COP/QL/TD series DTH hammers.

Specifications:

1. Engine

Cummins turbocharged, diesel engine,6CTA8.3

- Power rating at 2200rpm.....194kW
260HP

2 Steel Feed

Hydraulic cylinder feed with hose guide and double drill tube support with break-out table and movable lower guide/dust hood

- Feed extension 1219mm 48"
- Feed rate, max..... 0.4 m/s 78.7 ft/min
- Feed force, max (pull up)..... 22 kN 4946 lbf
- Tractive pull, max..... 100 kN 22480 lbf
- Total length..... 7550 mm 25'
- Travel length..... 4600 mm 15' 1"
- Feed force (pull down)..... 51 KN 6969 lbf

3. Dust collector DCT 140

- Filter area..... 14 m² 150 sq.ft
- Suction capacity at 500 mm wg..... 350 l/s 742 cfm
- Suction hose dia..... 127 mm 5"
- Cleaning air pressure, max..... 8 bar 116 psi
- Cleaning air consumption.....2-4 l/pulse 0.06-0.12 cf/ pulse

4. Safety cabin

- ROPS and FOPS approved with rubber vibration dampers
- 2 x wipers with washer (front and roof windows)
- Clear laminated glass (front and roof windows)
- Clear toughened glass (front and roof windows)
- Fully adjustable operator's seat
- Cabin light
- Rig inclination indicator
- Rear view mirror
- Fire extinguisher 6 kg (13 lbs) dry chemical ABE class III type Outlet socket, 24V
- Combined front mounted platform/tool box

5. Air conditioner

- Refrigerant.....R 134a
- Cooling capacity.....7.4 kW
- Fan suction capacity.....125 l/s 265 cfm

6. Compressor

Atlas Copco XAVS600 drill pert, single stage screw type compressor

- Working pressure, max..... 14 bar 200 psi
- FAD, at normal working pressure..... 225 l/s 480 cfm

Hydraulic system

7 Hydraulic oil cooler

- Max ambient temperature..... 50°C 122°F

8. Pumps

- Gear pump (1)52 l/min 13.7 US gal/min
- Gear pump (2)52 l/min 13.7 US gal/min
- Gear pump (3)32 l/min 8.45 US gal/min
- Gear pump (4)16 l/min 4.3 US gal/min

9. Return and drainage filters

- Filtration rate.....10 µm absolute

10. Carrier

- Trimming speed, max..... 2.4 km/h 1.5 mph
- Traction force, max..... 100 kN 22480 lbf
- Track oscillation..... ±10°
- Ground clearance..... 415 mm 16”

11. Electrical system

- Voltage..... 24 V
- Batteries..... 2 x 12 V, 180 Ah
- Alternator..... 24 V, 75 Ah
- Work lights, front..... 3 x 70 W
- Work lights, rear..... 1 x 70 W
- Warning lamp and reverse buzzer
- Work lights, feed.....2 x 70 W

12. Volumes

- Hydraulic oil tank..... 200 l 53 US gal
- Hydraulic system (total)..... 280 l 74 US gal
- Compressor oil..... 27 l 6.1 US gal
- Diesel engine oil..... 25 l 6.6 US gal
- Diesel engine, cooling water..... 33 l 8.7 US gal
- Diesel engine, fuel tank..... 300 l 80 US gal
- Traction gear..... 3.8 l 1 US gal
- Lubrication tank (HECL+ECL)..... 18 l 5 US gal

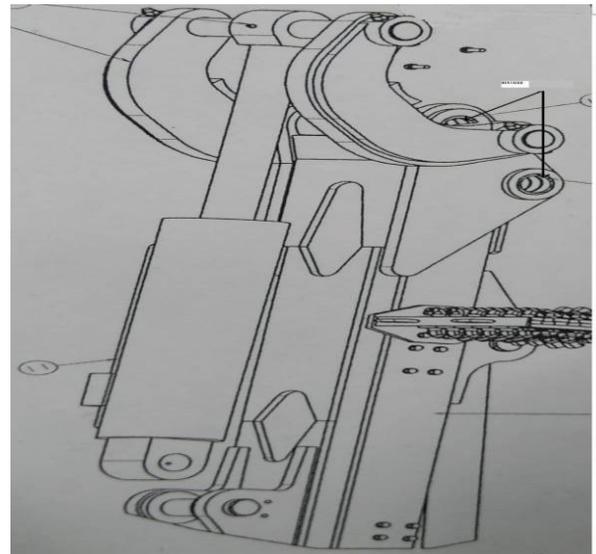


Fig.2 : Boom of PowerROC D40

4. Design Procedure

1. We first took all dimensions of boom, boom pedestal, boom head, straight link. Then we took average of all dimensions and assuming suitable length of rod which will be used in handy press
2. Dimensions of fix plates are greater than the dimension of bush which is to be fitted in the boom
3. There is power pack which is used to operate single acting cylinder.
4. The rod is connected to single acting cylinder.
5. There are slots on the rod, in this slots bushes and fixed plates are placed.
6. Then rod will be inserted into the bore in which bush is to be fitted.
7. When cylinder is performing forward stroke then due to movement of rod right side bush is pressed into bore.
8. During return stroke of cylinder rod moves to the left side.
9. Now left side bush will be pressed into the bore and the stroke completed.
10. Above procedure will be carried out for other parts.

Advantages and Disadvantages

Organizational

1. Reduce cost of part
2. Reduce time of assembly

Shop floor

1. Safety of works
2. Reduced efforts
3. Uniform pressing of bush into the bore
4. Easy removal of bush

Disadvantage

1. Initial cost is more. (But organization is ready to bear this cost considering long term profit)
2. Required man power because the weight of cylinder

5. Conclusion

So, with the help of this project, currently fitted by hammering it would be substitute by the bush fitting handy press. With a simple hydraulic mechanism there would be comfortable in operation.

The advantage of this mechanism would help in better development of process. So, considering the overall benefit in economical way, the project implementation would help in development of company. At present we are designing for "Power roc D40" machine but its successful implementation would help in further development of other similar machine

ACKNOWLEDGEMENT

We wish to thank our organization for supporting us to accomplish our work.

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