FETTLING & SHOT BLASTING AREIGNORED OPERATIONS IN FOUNDRIES

P. A. Patel.

e-mail: info@pshotblast.com; Web: www.pshotblast.com

ABSTRACT-The purpose of this technical paper is making foundries more aware about importance of fettling and shot blasting equipment, its design, construction and maintenance. It is useful to MSME units.

INTRODUCTION

Most of the foundries think shot blasting and fettling are an out source activity. As soon as castings are cast and cooled, they are loaded on tractor and unloaded at shot blasting contractor`s premises for shot blasting. Many foundries demand fettling and painting also to reduce their cost of man power and improve profitability. Contract based shot blasting out side has many disadvantages. First their machines are procured from small vendors, which are poor in design and quality, having no control on operation. Sometime castings are over blasted or under blasted. If castings are with fins and if they are broken, castings get rejected and create loss to foundry. When you outsource surface finish suffers. Shot blasting contractor normally uses S 660 (170mm) size steel shots (abrasive media) which gives longer life and reduced shot consumption but due to large size, castings get denting, increase in roughness and attract rejection. Sometime due to break down of machine or under maintenance,

Delivery of blasted castings get delayed 5 to 6 days, affecting dispatches, billing and cash flow of foundry.

Most of the places fettling contractor prefers doing shot blasting where machine, space& power is supplied by foundry, Contractor, brings his man power, shot, spare parts and carries out various operations. Two Wheel Y Type Hanger 500 Kgs. and 1000 Kgs. Hook Capacity Shot Blasting Machine are the most popular among foundries.

Two Wheel Y type hanger shot blasting machine (**Fig-1)** is most suitable for small & medium foundries, where jobs are suspended on trees, hung on manual or motorized trolley. They*are carried into abrasive*

Typical production and approx. costing of 500 Kgs. and 1000 Kgs. Y Type Hanger as follows:

Model	**2 Wheel Y Hanger**	**2 Wheel Y Hanger**
Work Load Capacity	500 Kgs. Per Hook	1000 Kgs. Per Hook
Total HP	30 HP	60 HP
Job Size	1000mm Dia. x 1500mm Height	1500mm Dia. x 1650mm Height
Average Production	200 MT/Month/8 Hr. Shift.	325 MT/Month/8 Hr. Shift
Cost of Blasting		
Shot Consumption	4 Kgs/Ton x 200t = 800 kgs. per month	6 Kgs/Ton x 325t = 1950 kgs. per month
Shot Cost	800kgs x Rs.45/-=Rs 36000 per month	1950kgs x Rs.45/-=Rs 87750 per month
Power Cost	(30HP) Rs 900/day x 25 days = Rs. 22500/-	(60HP) Rs 1575/day x 25 days = Rs. 39375/-
Spare Part Cost	Rs. 7000/-	Rs. 10000/-
Labour Cost	2 x Rs 350/- x 25 days = Rs. 17500/-	3 x Rs 350/- x 25 days = Rs. 26250/-
Total Cost of blasting Per Month	Rs. 91500	Rs. 163375
Cost Per Ton	45 Paisa Per Kgs.	50 Paisa Per Kgs.

stream; job rotates clock-wise and anticlockwise slowly so that jobs rotate and are cleaned from all sides. Upon completion of blasting, door is opened and hanger with blasted components is taken out manually or on motorized trolley and second loaded hanger is pushed in. Various work handling like Straight, T's Y can handle 500 Kgs to 1000 Kgs., or more. We have more than 400 machines in operation in India & abroad. Typical components handled are Automobile Components, Textile, Cement, Agro Machinery, Machine Tool Castings, Sanitary Castings, Railways and Defense Components.

Y Type Hanger Shot Blasting Machine

Many auto component contractors use this machine to clean cylinder head, brake drum, fly wheel and many other components. 500 Kgs., Y hanger will produce 20 to 25 Ton/24 Hours and 1000 Kgs. Y hanger will blast 35 to 40 Ton in 24 Hours (Fig-2)

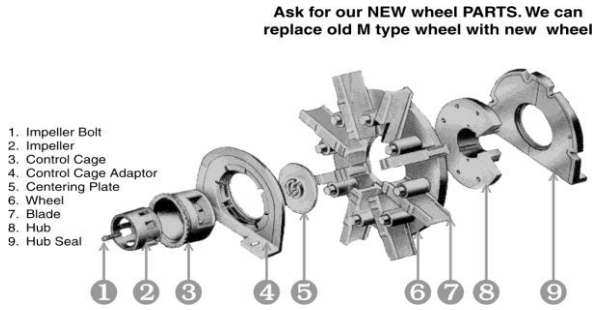
Fig-2. - Y Type Hanger

and using steel shots (abrasive) size 660 (1.70mm) Or S 550 (1.4mm) shots. This includes loading and unloading, blasting. Employing2 to 3 persons giving reasonable return to MSME enterprises and quick delivery for foundry. There are several new features added to our shot blasting machines design to improve quality, increase production and reduce power. Some of the features are as follows:

New RLM Wheel

With need to increase output it has become apparent that shot blasting cycle on the machine must be reduced. In effort to give increased output we have introduced new RLM wheel, which throws more abrasive and consumes less power. In this way one machine is able to do the work formerly done by two machines. The new wheel has larger control cage and impeller making it possible to throw more abrasive resulting in better and faster cleaning and ease of maintenance.

(Fig.3). - New RLM Wheel



Direct drive wheel

(Fig.4) - Direct Drive Wheel

Our new direct drive wheel uses direct coupled motors, throws more abrasive as it is running at 2800 RPM, useless space compared to RLM wheel reduces power usage and it is bi directional, so it will run clockwise and anti-clockwise, so only one set of spares is required which reduces maintenance. With frequency convertors, rotational speed are adjusted and different surface and dimension can be treated. Aluminum, window section, thin wall castings can be blast cleaned without deformation.

SEPARATOR FUNCTION

Foundry sand drastically increases wear on blade, impeller, and control cage in blasting machine. Therefore it is necessary to remove sand from shots. The function of the separator is to remove

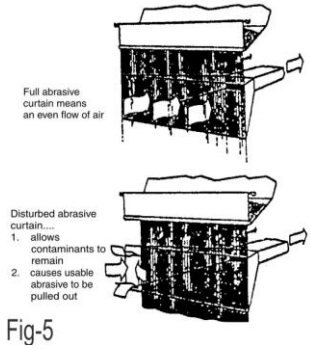


Fig-5

sand and contaminants from abrasive so that good cleaned abrasive of proper size are fed to the wheel. Separator also controls the size of abrasive mix, this gives faster and better.

What usually goes wrong with separator, ? The drop of air pressure on separator can be too great, causing the removal of good shot with sand. This can be corrected by adjusting the blast gate sliding baffle and swing baffle.

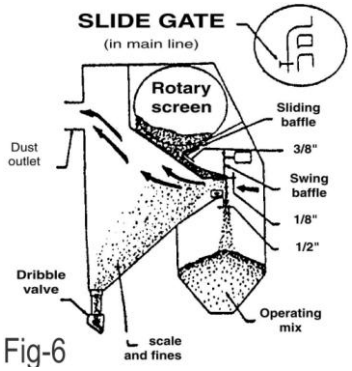


Fig-6

If the separator is functioning properly, sand will continue to come out of dribble valve when shot blasting machine is running. As the effective operation of the separator depends on the airflow, please ensure that filter collector either bag type or ultra-jet or cartridge type is operating efficiently.

MAGNETIC SEPARATOR

Patel Furnace offers magnetic separator Fig-7 when there is extremely heavy sand load condition. For example large size steel valve body has very heavy cores. During first three four minutes of blasting sand and shots are released in large quantity. The magnetic separator significantly increases the ability to remove sand from steel shot or grit. The addition of magnetic separator to shot blasting machine

(Fig.7)- Magnetic separator

Increases the life of wearable parts like blade, impeller, control cage, liners etc., because sand is the primary cause of wear. Magnetic separator reduces blast cycle time, increases the life of replacement parts, reduces equipment maintenance and abrasive consumption and total operation cost.

Blast Pattern

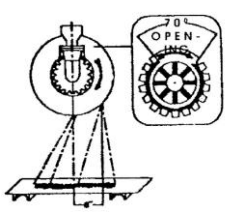


Fig-8

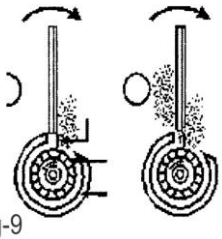


Fig-9

Fig 8, shows Blast Pattern located 8" inches to the right of the Vertical centerline on a clock-wise wheel, The Pattern is called hot Spot and will feel warm to the hand if touched immediately after shot blasting. The ½" movement of control cage opening will shift the Blast Pattern by several inches. Wear tolerance has been built into blast equipment but when wear goes beyond the tolerance components like Blade, Control Cage, Impeller, cannot perform properly and blast pattern shifts from set target. When wear on the leading edge of the impeller exceeds 4 to 5mm. The abrasive will hit the back of the blade than being delivered to the throwing face. Fig 9, as a result the hot spot and over all blast pattern becomes badly differed and causes increase blasting time and wear on bare wheel and other wheel components.

WHEEL UNIT LINERS

The blast wheel is usually enclosed within a housing serving as a safety guard. Abrasive seal around rapidly rotating wheel helps to minimize wear on the housing A series of special alloy cast liners, installed inside the housing.

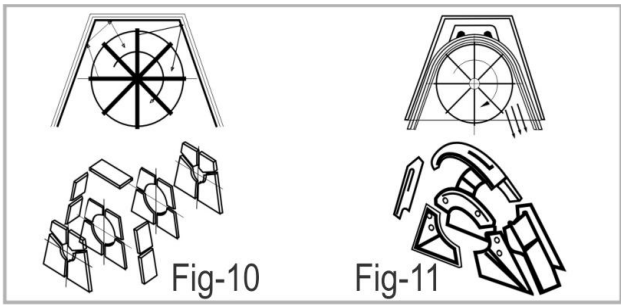


Fig-10 Fig-11

Older wheel Fig-10 consisted of 21 liners where abrasive bounces in uncontrolled manner. In our new RLM Fig-11) wheel only nine liners are installed inside the housing. High chrome liners are approx. 25mm thick with labyrinth type joints providing an abrasive tight seal between the liners and give long life.

FUNCTION AND ROLE OF BLADE , IMPELLER CONTROL CAGE:

Fig.12-Blade, Impeller, control cage

The blade plays a key role in shot blasting operation. The blade catch the shot delivered from impeller and control cage and throw out to work pieces with an accelerated speed.

The blade is the quickest wearing part among all moving parts. As the wear widens the disperse angle of shot will change and reduce the projection speed. The blade should be changed every 300 to 400 hours of blasting operation.

SHOT &ABRASIVE

Effect of Shot Size on Impact & Coverage

SHOT SIZE Inches	in (mm)	Approx. Impact Value	Approx. Nos. of Shots / lb	Equiv. Size of I n Grit
.070"	0.18mm	1	82,00,000	G-80
.0110"	0.30mm	4	21,00,000	G-50
.0170"	0.40mm	9	7,45,000	G-40
.0230"	0.60mm	20	3,24,000	
.0280"	0.70mm	33	1,92,000	G-25
.0330"	0.80mm	55	1,14,000	
.0390"	1.00mm	90	68,000	G-18
.0460"	1.20mm	150	40,000	G-16
.0550"	1.40mm	260	24,000	G-14
.0660"	1.70mm	440	14,000	G-12

Shot Impact Value varies as the cube of the diameter (2: 1 Size = 8:1 Impact Value and 1:8 number of shots / lb). Considering Impact value of 70 size shot as 1.

Fig.13- Shot & Abrasive

The impact Power, and coverage of steel abrasive is governed by its mass and velocity in accordance with equation of kinetic energy. Ke = ½ MV2 (Where Ke = Kinetic Energy M=Mass V=Velocity).
The impact force delivered to the work piece will change only if the mass factor (i.e. the abrasive size) is altered. The relationship of abrasive size to both impact power and coverage is shown in figure 13.

The economy and performance of blast cleaning depends upon the abrasives used. The proper size, type of abrasive and it's quality are most important.

The following five factors should be considered while selecting the abrasives (a) Area of job surface to be cleaned (b) Quality of work produced (c) Cost of the shots (d) Quality of shot. (e) Production in 8 HRS. (f) Consumption of shots in 8 Hours.

Debarring Aluminum Castings

Aluminum Die casted components manufactured from Aluminum, Zink & Magnesium Alloys Like Crank Case, Clutch Cover Case, Cylinder Blocks, Brake drum etc. require to be blasted for removing burrs, and also gives aesthetic value with aim to obtain even, shine finish on all sides. Many users

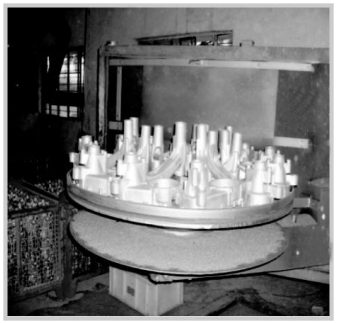


Fig.14-Deburring Aluminum Castings

prefer stainless steel shot as the consumption is one sixth of steel shot; carbon steel shot give dull grey finish, while stainless steel imparts matt silver finish pleasing to eye. Many auto units like Honda, Bajaj, and Endurance use stainless steel shots.

Concluding Remark

Shot Blasting & Fettling are important process in foundry. It provides fast and better cleaning. It saves power. If foundry provides space and finances, small 500 Kgs, Y hanger to MSME enterprises with help of 2 to 3 labors can shot blast and fettle 20 to 25 Ton in 24 Hours and 35 to 40 tons / 24 hours in 1000 Kgs., Y hanger type machine, giving value addition to foundry and employment to new entrepreneurs under "Made In India" scheme. Ours is 100% indigenous machine developed over a period of 25 years' experience and sold more than 3500 machines in India and abroad.