

SHOT BLASTING INCREASES EFFICIENCY & SURFACE FINISH IN FOUNDRY INDUSTRIES

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Introduction

There are about 8000 foundries in India out of which around 5,100 are in organized sector producing 7 million tones castings, holding No.2 position in Global Market. Considering 32% Casting required by Auto Industry. It will need 2.18 million tones, which will go up to 10 billion by tones 2016.

Indian foundries manufactures: Grey Iron, Steel & Alloy Castings, S.G. Iron, Non Ferrous Castings, Ductile Iron , ADI, Light metals & copper alloys, Aluminum and many other grades.

Most of the foundries are located at Belgaum, Coimbatore , Batala, Jalandhar , Kolhapur, Rajkot, Ahmedabad, Mumbai, Pune, Gurgaon, Faridabad, Agra, Ambala, Chandigarh, Hawarah , Shimoga, Raipur and many other places.

Introduction

In addition to foundry mentioned above there are many captive and jobbing foundries to meet export demands. Many foundries are setting up full finished auto components unit with excellent facility, high pressure molding line, modern core shop, automatic fettling and shot blasting systems.

Sector wise Major Consumption of Casting :

- | | |
|----------------------------------|--------------------------------|
| 1. Auto Industry – 32% | 8. Electrical Equipments – 03% |
| 2. Agriculture Machinery – 07% | 9. Machine Tool – 02% |
| 3. Earth Moving Equipments – 02% | 10. Pipes & Fittings – 08% |
| 4. Pump & Compressors – 05% | 11. Railway – 06% |
| 5. Valves – 04% | 12. Defense – 04% |
| 6. Diesel Engine – 03% | 13. Power Generations – 05% |
| 7. Sanitary – 02% | 14. Industrial Machinery – 07% |
| | 15. Others – 10% |

Product Mix of Caste Metal Items

- | | |
|------------------------|----------------------|
| 1. Grey Iron 67% | 2. Steel..... 12% |
| 3. SG Iron..... 10% | 4. Nonferrous ...10% |
| 5. Malleable..... 01% | |

Gujarat - New Auto Hub

.There are many foundry clusters coming up in Gujarat for manufacturing of automobile components. The reason being large auto projects coming near Sanand, Ahmedabad. Some of the projects are Tata Motors, Ford India, Peugeot, General Motors, Maruti Suzuki, Atul Auto, Bajaj Auto, Asian Motors and the list is growing. Gujarat Government has put a target of production of 2-3 Lacs cars / year by 2015 through above units which will mean increasing production of existing foundries, setting up new foundries, technology up gradation, cluster development, training and education of the worker.

In addition to Companies mention above there are many captive and jobbing foundries to meets export demands. In 2010-11 the casting export US \$3 million aapprox (2.5 million tones) to meet export demands.

Two Systems of Blasting:

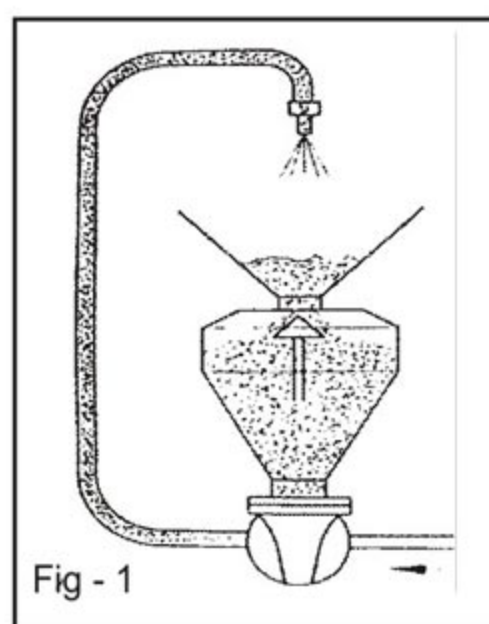


Fig - 1

“Pressure Blast System”: In pressure blasting system the blast media is stored in pressurized vessel, which is mixed with compressed air.

The air flow accelerates the media, through a blast gun on to the Surface.

10mm Nozzle 5 Bar Pressure. Blast Media Flow : 22 Kgs. / Min. Air Consumption 275 M.s. / Hr. Energy Consumption 25 KW. Specified Energy Consumed 1.14 KW/KG.

Blast Wheel Blasting System:

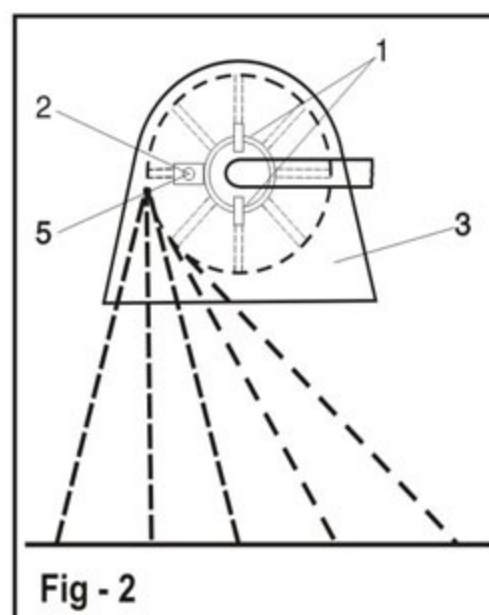


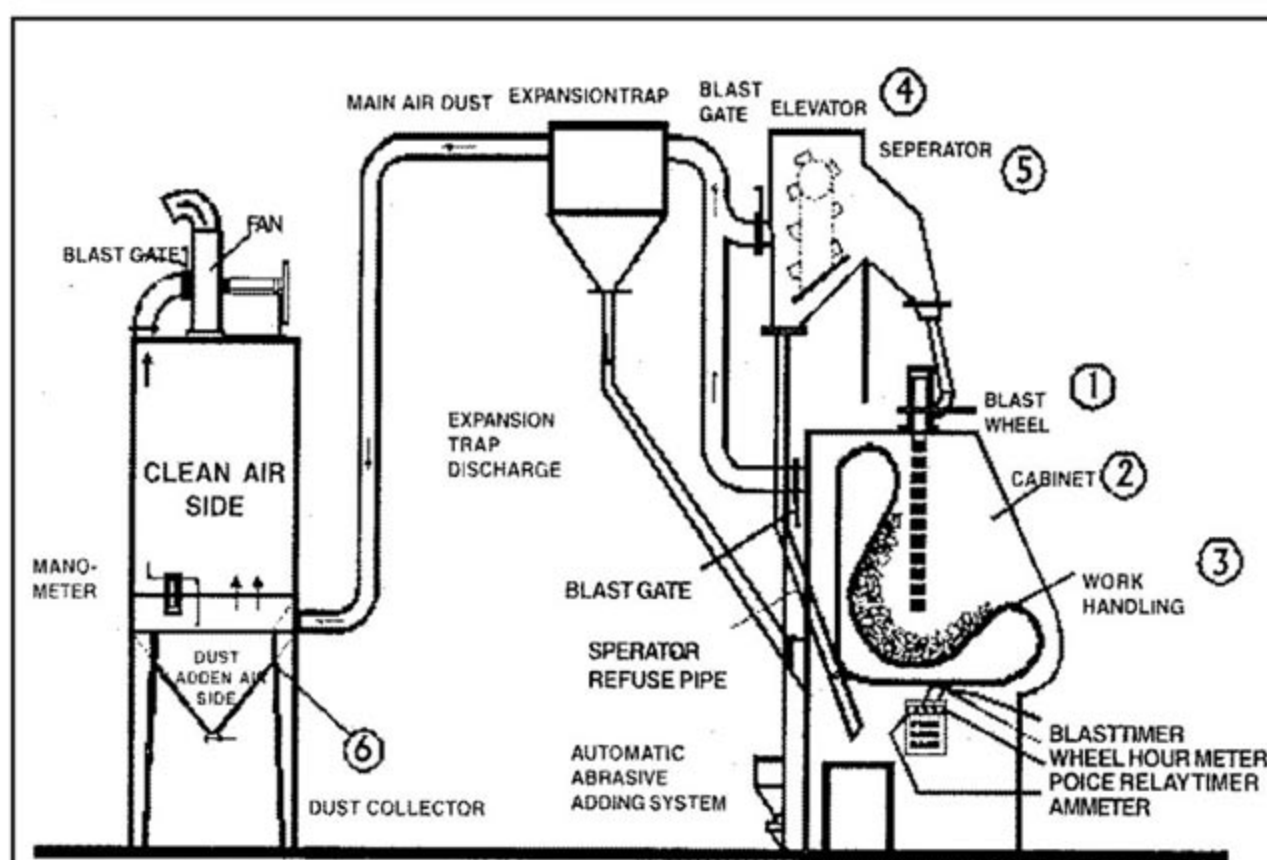
Fig - 2

In blast wheel system the blast media is fed to the center of the blast wheel, which is rotating at high speed. The media is rapidly accelerated by centrifugal force and is directed on the surface to be blasted.

Blast Media Flow 150 Kgs. / Min. Air Consumption Negligible Energy Consumption 7.5 KW Specified Energy Consumption 0.05 KW/Kg.

This comparison of different blasting systems, clearly shows that the blast wheel blasting system (fig - 2) has the lowest specified energy consumption. Blast wheels are driven by electric motors, whereas the air required by the air blasting system (fig -1) has to be generated by a compressor which is to be purchased and maintained in addition to blast machine itself and the additional power cost.

The Machine



.For efficient shot blasting operation we should understand the basic concept of the process and the machine.

The shot blasting machine consists of six basic parts:

- | | |
|----------------------------|--------------------|
| 1. Blast Wheel | 4. Elevator |
| 2. Cabinet | 5. Separator |
| 3. Work Handling Mechanism | 6. Dust Collector. |

Let's take a close look at these six parts and see what role each plays in the shot blasting process.

Blast Wheel

Abrasive particles are projected by centrifugal force from various kinds of turbine wheels. The number of wheels installed in the machine depends on the type of jobs to be shot blasted and the rate of work. The wheel is the heart of every centrifugal shot-blasting machine. Efficiency and cleaning effect depend to a great extent on the quality of the wheel and its components.

Cabinet

As high speed of abrasive particles (50-100 m/s) is involved the articles to be shot-blasted have to be treated in closed, vibration free booth or cabinet made of strong steel, lined with wear resistant alloy liners. For maintenance purpose proper inspection door and ventilation are essential.

Abrasive Recovery System and Elevator :

The abrasives are recovered at the bottom of the cabinet by means of a screw conveyor and delivered to the base of the elevator, which then carries these to the separator.

Separator :

Before abrasives enters into the blast wheel for reuse, these have to be cleaned of all contaminants. This is the role of the air separator.

Dust Collector :

The last essential feature is the filtration, which retrieves dust laden air from the separator and cabinet ventilation system and discharges clean air into atmosphere for pollution free environment.

Work Handling :

The abrasives are recovered at the bottom of the cabinet by means of a screw conveyor and delivered to the base of the elevator, which then carries these to the separator.

Some of the Finish Castings Show below : (Fig - 1)



Tumblast Type Machine

(Fig - 2)

This design employs endless conveyor



belt made of steel link and flats or rubber belt, which does not damage the job during tumbling.

1, 2, 5, 7, 8, 14, 28, 34, Cubic Feet
Capacity: 50 Kg. to 2500 Kg

Table Type Machine

(Fig - 3)

In this type of machine parts being cleaned must be positioned or repositioned on the table to assure complete cleaning of the full surface.

This design employs endless conveyor belt made of steel link and flats or rubber belt, which does not damage the job during tumbling.

Capacity : (Fig - 3)
900 MM. 300 Kg. Approx
1200 MM. 800 Kg. Approx
1800 MM. 2300 Kg. Approx
2400 MM. 4500 Kg. Approx



Hanger Type – Y Straight / Loop / Monorail

(Fig - 4)

In this type of machine, parts are suspended on trees hung on hanger or special fixtures and are carried into the abrasive stream.

2/3/4 Wheels (Fig - 4)
Capacity:
500kg-2000 Kg. Per Hanger



Door Hanger Machine

(Fig - 5)

In this machine jobs are hung on the door. The parts are carried into abrasive stream after closing the door. The parts are mounted in front of the wheel. On completion of shot blasting, door is opened and second door with job hung enters the cabinet. In this type of machine, one may get 30 to 40% more production.

1/2 Blast wheel (Fig - 5)
CAPACITY : 100 - 500 Kgs.



Aluminum deburring

(Fig - 6)

Aluminum Casting Deburring with shot blasting is the fastest and most economical way to deburr auto components like cylinder heads,



water pump bodies, exhaust mufflers, Armature Covers, Aluminum die casted components etc.

The Shot Blasting provides uniform, homogeneous matte surface. In addition to deflashing it is an inspection tool, revealing defects in casting and minimizing porosity problems.



Continues Monorails

(Fig - 7)

Monorail Hook Shot Blasting Machines, available semi automatic or fully automatic. The parts are suspended on the trees, hung on hangers or special fixtures and carried in to abrasives stream. Shot blasting removes sands, scale from castings like Cylinder Blocks, Cylinder Heads, Tractor and Diesel Engines Components, removes rust from Fabricated structures of Earth Moving Equipments etc.

(Fig - 7)

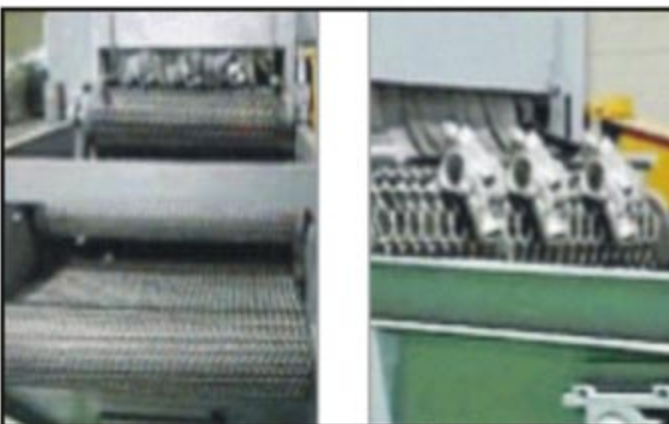


Wiremesh Belt Conveyor Machine

(Fig - 8)

Wire mesh shot blasting machine are suitable for castings with thin fins which can not be tumbled in tumblast machine. Wire mesh machine is also suitable for fabricated components, forgings, high production surface finishing. The machine is designed specifically for economical and productive Descaling, surface finishing and Deburring . The machine has opening of 18" height and 40" width (450x1000 mm).

(Fig - 8)



Railway Components

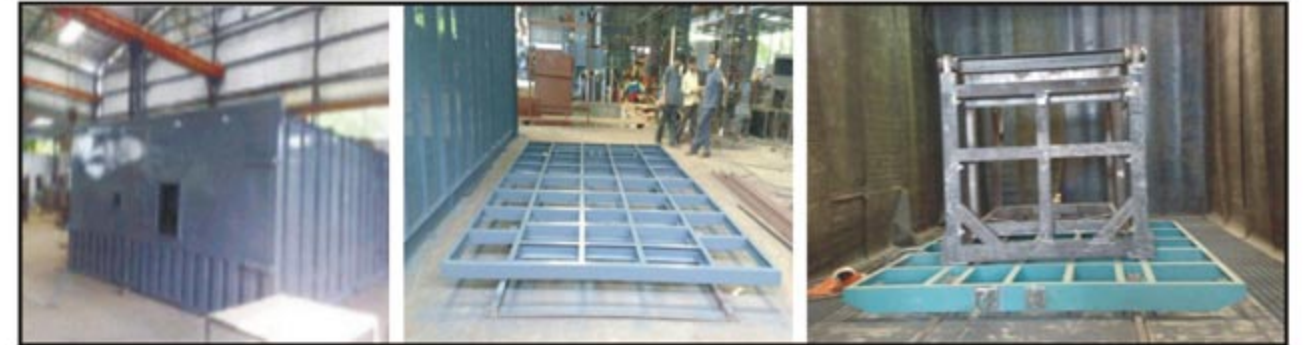
(Fig - 9)



Room Plant

(Fig - 10)

Patel Furnace & Forgings offers variety of Blast Rooms/Plants systems to perform blasting operation inside the cabin. The room dimension are governed by job size automatic and semi automatic recovery system since production condition vary from plant to plant, Every blast room is customer designed. Blast rooms system is



made up of blast room enclosure, abrasive recovery system manual or mechanical.

Pressure & Suction Hand-Cabinets

(Fig - 11)



Moulding Technique:

Most popular moulding technique used in India is green sand moulding and About 80% of foundries use this technique. The drawback of this technology is that large amount of sand, sticks on surface of the castings, which are to be cleaned by shot blasting.

Foundry, using cupola has more sand compared to automated foundries. Other technology like CO2 process, has 5 % to 10 % sand sticking to casting because of bad shaking operation, poor property of mould and core there fore shot blasting is quite essential.

There are number of items produced by Indian foundries. Some of them are impeller castings. pump castings, valve bodies & automobile or tractor components like break drum, cylinder head, housings, fly wheel, manifold covers, weighing from 5 kgs to 60 Kgs. or more. To clean these castings it takes 7 to 10minutes using S-550 (1.4mm) shot. Some other types of castings when hanged on monorail take 15-20 minutes for a lot of 500 Kgs. or more.

Properly designed shot blasting machine will not only clean the castings efficiently, but it will also satisfy the users quality needs and also assure optimum productivity and the lowest possible operating cost.

Shot & Abrasive:

(Fig - 12)

The impact Power and coverage of steel abrasive is governed by its mass and velocity in accordance with equation of kinetic energy.



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

The economy and performance of blast cleaning depends upon the abrasives used. The proper size and type of abrasives and its quality which is most important.

Shot & Abrasive : (Fig - 13)

Effect of Shot Size on Impact & Coverage				
SHOT SIZE		Approx. Impact Value	Approx. Nos. of Shots / lb	Equiv. Size of I n Grit
Inches	in (mm)			
.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.



Shot & Abrasive

The following four factors should be considered while selecting the abrasives

- (a) Area of job surface these can clean
- (b) Quality of work produced
- (c) Cost of the shots
- (d) Quality of shot.

Child Iron Shots :

The shots are manufactured by quenching the stream of molten gray iron over high pressure water jet. Its hardness is about 60 Rockwell C. Due to this hardness and quenched structure it fractures and disintegrates very quickly on impact with the work surface. Due to greater amount of dust produced in fracturing process, the part cleaned by chilled iron shot does not have very good finish. Also the maintenance cost is very high. This led to the introduction of malleable iron-, cast steel-, cut wire-shots and heat treated steel shots.

Heat-Treated Steel Shots :

The heat treated steel shots are having hardness of 45 Rockwell C (424 Brinell hardness). These are the most suitable for the shot blasting machine.

Comparison b/w Blasted & UnBlasted Components (Fig - 14)



Concluding Remarks:

Shot blasting is no more an optional process. It provides faster and better cleaning. It saves power, labour, space and also saves on cutting tools and permits better inspection, thus minimizing the rejection of castings. Apart from foundry it is also widely used in many other industries. Proper understanding about the machine, its construction and use enables us to improve its efficiency and utility. Before Selecting the equipment it is necessary, to consider above points, spare parts, availability, sales services offered, and many other points, with humble beginning in 1990-in 22 years we have supplied more than 3000 machines for various applications.

Foundry Industry will have to upgrade produce good quality casting and finishing. No buyer will tolerate delay in delivery, defective casting. Foundry will have to adopt new and efficient fettling and finishing practice with several new auto units coming up demand for automotive castings will increase and local manufacturer will have to increase their capacity to meet delivery in time,

PANGBORN Our Business Partner (Fig - 15)

We represent Pangborn group of companies which provide solution for surface preparation, The company is located in Europe and USA and have distribution network all over the World the company is technology leader, we proved special machine for auto Industries. aviation Industries. Railway & many other application.



INDUSTRY SECTORS

