

# CONTINUOUS FLOW SHOT BLAST MACHINES

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## Innovative work piece transport system produces excellent blast results

When it comes to shot blasting steel and non-ferrous metal components, the THM continuous feed shot blast machines with their unique troughed belt work piece transport system are increasingly replacing conventional batch tumblast and spinner hanger machines. The THM machines generate better blast results, simplify the work piece handling and can be easily integrated into linked manufacturing operations.

In the future the producers of work pieces that require an excellent surface finish will have to deal with a wider spectrum of work piece geometries and sizes, from very small to large.

The continued improvement of manufacturing and forming/shaping technologies has the effect that the work pieces that must undergo a shot blasting operation are constantly getting bigger. At the same time they also become geometrically more complex and more delicate. This trend has been noticeable for components made from steel, aluminum, zinc and magnesium for years. And it is expected that it will actually accelerate in the future.

On the other hand, we are increasingly receiving requests for shot blasting of parts that are becoming smaller and more complex. Such delicate work pieces must be gently processed and transported. As a manufacturer of shot blast machinery we notice a clear trend towards continuous flow shot blast equipment. This applies equally to smaller as well as bigger work pieces. The obvious advantages are a consistently high quality of the blast results for every single component and less need for manual operations. Continuous shot blast machines can also be easily integrated into the overall manufacturing process. Therefore, it is not surprising that they are increasingly replacing cost-intensive batch processes.



## A brilliant idea: The troughed belt

The troughed belt work piece transport system, exclusively utilized by Walther Trowal for its shot blast machines, gently transports the work pieces through the machine in a spiral movement. It causes the work pieces to continuously tumble over each other so that they receive an all-around, intensive blast treatment.

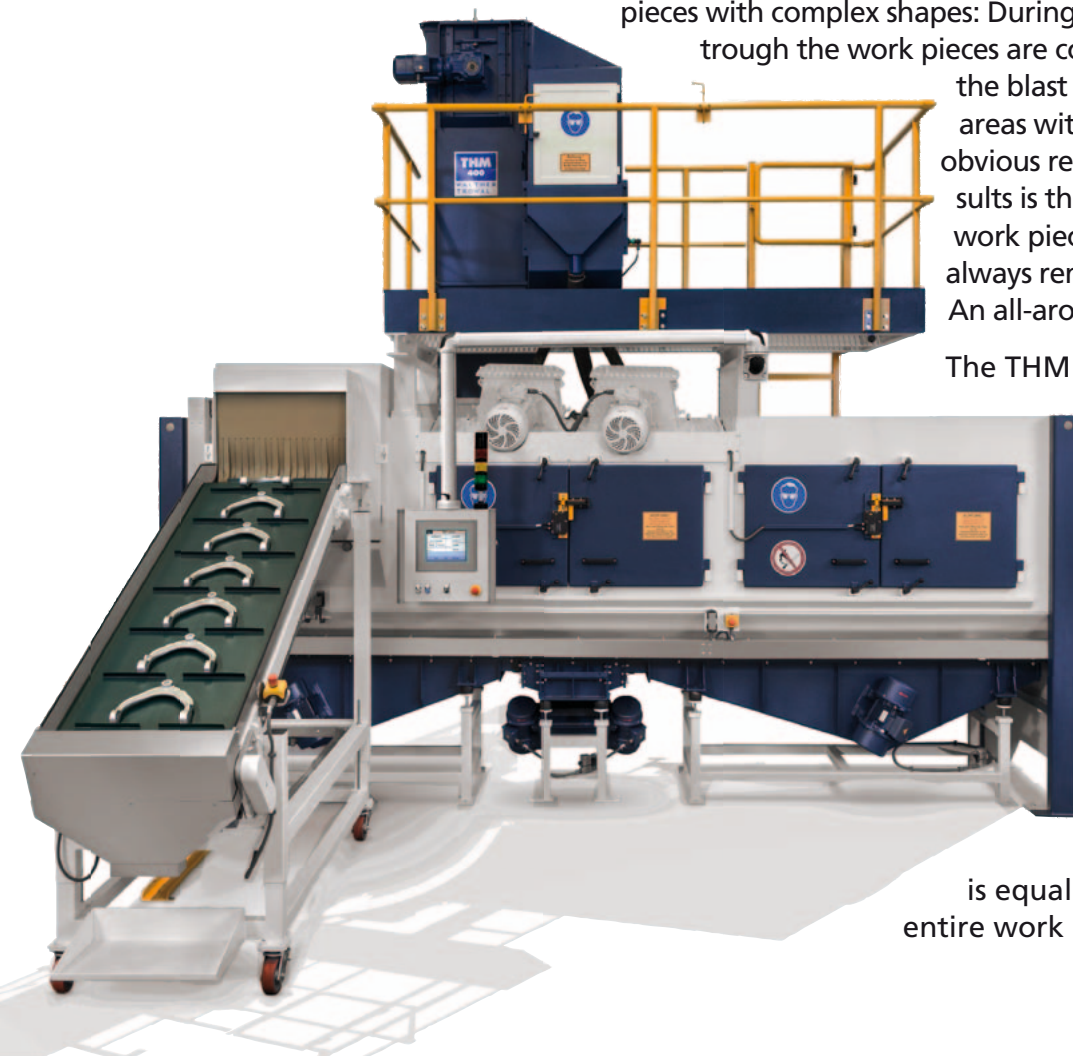
The technical advantages of the continuous flow THM machines are especially obvious with work pieces requiring a more demanding surface finish: The work pieces are not colliding in the trough but touch each other lightly. Moreover, they are not falling on top of each other but tumble gently over the polyurethane rods forming the trough. Considering the continued trend towards delicate work pieces requiring extra careful treatment, the "soft" work piece transport in the THM machines is especially advantageous. The unique troughed belt system ensures that the work pieces are passing through the machine without nicking or any other damage.

The THM 400/2/E shot blast machine with loading belt

Compared to spinner hanger shot blast machines the continuous troughed belt systems generally produce better, more homogeneous shot blasting results. This is especially true for work pieces with complex shapes: During their transport through the trough the work pieces are continuously rotating so that

the blast media reaches all surface areas with the same intensity. The obvious reason for these excellent results is that the distance between the work pieces and the blast turbines always remains the same. The result: An all-around uniform blast pattern.

The THM machines also allow the shot blasting of work pieces with thin walls without any warping. Because of the short distance between the turbines and the trough smaller blast media can be used, or the turbines can run at a lower RPM. This reduces the impact energy of the media on the work pieces. At the same time, the energy is equally distributed over the entire work piece surface.



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## The applications

The THM troughed belt shot blast machines were developed for the targeted, precise surface texturing, cleaning, deburring/de-flashing and stripping. They are equally productive for processing small, mass-produced parts as well as complex and delicate larger components made from steel, brass, aluminum, zinc or magnesium.

There are numerous work pieces that can be processed in THM machines. For example, pliers, wrenches and connecting rods made from steel. Also brass fittings or forged aluminum parts like steering knuckles and swivel bearings. Examples for zinc die-castings are delicate furniture fittings, components for household appliances and antennas. Very small parts can be the bodies and doors of model cars, which to date could not be processed in continuous flow operations.

Aluminum die-castings processed in THM machines can be all kinds of housings, lids, covers or levers. Today numerous structural components, such as dashboard frames for automobiles, are made from magnesium, because this material is light-weight and, at the same time, has a high tensile strength.

## The THM machines

The work pieces are fed into the inlet section of the machine and are then passing through the blast section to the machine outlet. During the transport they are rotating so that all surface areas are equally exposed to the accelerated blast media.

The rods forming the trough of the machine are always adapted to the technical characteristics of the work pieces: For the gentle transport of delicate components such as die-castings, they are usually made from polyurethane. For relatively sturdy work pieces made from steel we are using manganese steel.

### Turbines

The troughed belt machines are equipped with turbines with an electrical power of 7.5 to 22 kW per turbine. Depending on the application, we are mounting between two and four turbines on a machine.

The small distance between the turbines and the work pieces guarantees an excellent energy utilization: Based on a compa-



Work pieces in the troughed belt (Picture 1) and a work piece in the outlet screen drum (Picture 2)



Cover for an electric motor housing



Raw valve for beer kegs



Operator panel of a THM shot blast machine with touch screen

erable work piece throughput, our turbines are working with 20 to 50 % of the energy required by the turbines in tumblast or spinner hanger machines.

### Turbines and throwing blades

In conjunction with aluminum blast media we are using specially designed turbines. They generate a significantly higher media throwing speed than conventional turbines and, therefore, increase the impact energy of every single media pellet on the work piece surface. This helps reduce the cycle times and, because of the lower bulk density of the aluminum media, ensures a gentle surface treatment.

For THM machines operated with steel or stainless steel media, Walther Trowal makes the throwing blades from high-strength tool steel. This guarantees high turbine uptimes, even with these somewhat harder, more abrasive media.

When we introduced the new turbines, we also took into consideration the THM machines that are already in operation at numerous customers in the field. Those customers can replace their old turbines with new ones. This allows them to improve their shot blast efficiency and lower their operating costs. The special "Y" design of the curved throwing blades allows the use of both blade sides. This practically doubles their usable life. Or, if needed, the rotational direction of the blades can be changed.

### Variable process control

Thanks to such flexible operating parameters like the adjustable work piece transport velocity, the variable media throwing speed and the automatic control of the media quantity, a precise adjustment of the process is possible.



### Blast media

The customer requirements, the work piece characteristics and the desired surface finish determine, which media type and media hardness must be utilized for the continuous flow shot blasting process. Frequently, carbon steel or stainless media are used. Brass fittings are mostly treated with brass or stainless media.

Our test center in Haan is equipped with several different blast machines. We also stock a wide variety of different blast media that are available for processing trials. This allows us to quickly develop and optimize shot blast processes in close cooperation with our customers.

## Aluminum media for blasting aluminum components

The blast treatment of light metal die-castings made from aluminum and magnesium or die-castings made from soft metals like zinc, generally requires a somewhat softer blast media. For this reason, aluminum media is increasingly used: It permits a gentler blast treatment than, for example, steel media and helps save costs at the same time. The new THM troughed belt machines were specifically designed for shot blasting with aluminum blast media.

Even though aluminum has a lower weight than steel media, the higher throwing speed in our machines produces a significantly higher work piece throughput that guarantees an excellent operational efficiency.

Because of their low bulk density the aluminum media pellets generate a smaller impact energy than other media. For this reason, we are using curved throwing blades in our turbines. They generate an about 30 % higher throwing speed than conventional, straight-bladed turbines.

Our blast machines are designed to handle a much higher blast media volume. That's why, despite the lower bulk density of the aluminum media, the shot blast operations can be completed within shorter cycle times without being too aggressive.

Aluminum has also the advantage that compared to steel or stainless steel media the wear rate of the turbines and the machine itself is practically zero. This helps to significantly reduce the overall operational costs.

A small detail: Since throwing blades with a rough surface would quickly grind down the aluminum pellets to a small particle size, Walther Trowal subjects the throwing blades to a surface smoothing operation in its in-house mass finishing machines.



Hand tool sockets



Steering knuckle for passenger car



Safety belt winding spool

### THE RESULT:

This reduces not only the media consumption but also results in much longer up-times of the blast turbines.



Forged connecting rods



The compact THM 300/1 shot blast machine

## Available THM models

Walther Trowal offers different THM machine models in different sizes, which can be precisely adapted to the technical characteristics of the individual work pieces. Considering their purchase price, their energy consumption and their excellent shot blasting results, the THM machines offer an excellent cost efficiency paired with a high work piece throughput.

### THM 300/1

The compact troughed belt shot blast machine THM 300/1 was specifically developed for processing small, delicate work pieces with thin walls, for example, aluminum and zinc die-castings with dimensions (measured diagonally) from 20 to 150 mm.

Such work pieces can be components for model cars, consumer electronics or furniture fittings. The THM 300/1 footprint is as small as that of batch machines but offers the advantage of continuous flow operation and a high work piece throughput. This helps to simplify and speed up the surface treatment processes.

The THM 300/1 is a real novelty, because it is the first continuous flow shot blast machine for small parts that is not bigger than a batch tumblast machine. Its space requirements amount to an area of 1.4 x 2.7 sqm. Therefore, it can be easily integrated into existing manufacturing lines. The THM 300/1 is Walther Trowal's response to numerous requests from customers in the foundry industry, who want to seamlessly integrate the surface treatment of small parts into their manufacturing flow.



The compact THM 300/1 with loading belt

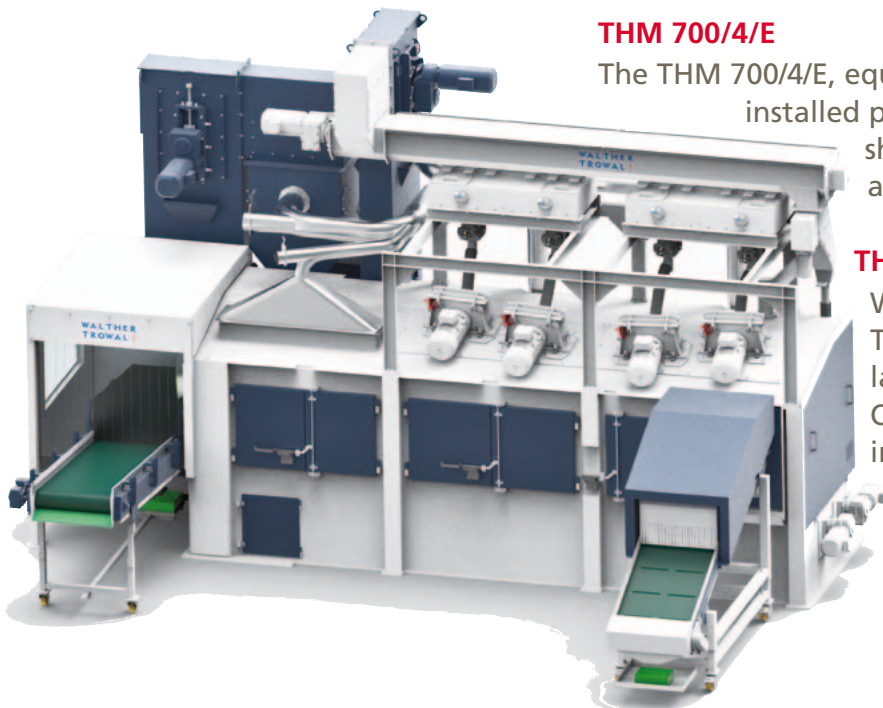
The THM900/4/E shot blast machine with loading and unload belt

### THM 700/4/E

The THM 700/4/E, equipped with 4 turbines with an installed power of 15 kW each, is the ideal shot blast machine for treating forged aluminum components.

### THM 900/4/E

With a trough diameter of 900 mm the THM 900 was designed for processing large, forged aluminum components. One of the many reasons for developing this machine type was the trend towards bigger automobiles with steering knuckles with a length of up to 750 mm.



## Work piece handling and peripheral equipment

The continuous flow processing concept fulfills a demand for a consistently high quality of each single component. Therefore, many customers replace their batch tumblast machines with continuous troughed belt machines.

The THM machines can also operate in "batch mode". In such cases the work pieces arriving at the shot blast machine in bins, are fed into the machine with lift & skip loading devices. Large work pieces can be automatically or manually placed on a transport belt that feeds them into the machine.

## Integration

### Seamless integration into interlinked manufacturing operations

With the increasing digitization of their production operations the customers are demanding that shot blast machines are also completely integrated into their overall manufacturing flow. In this respect continuous flow systems offer the possibility to displace centralized batch operations. Many users are placing their shot blast machine directly behind their forging station or their die-casting machine. The work pieces arrive at the machine with exactly the same speed they were produced in the preceding machines. The intermediate transport from one process stage to the next and intermediate storage of work-in-process components are completely eliminated.

Pre-condition for integration into the 4.0 manufacturing environment is the continuous data exchange through digital networks. Therefore, many Walther Trowal machines are already now electronically linked with the preceding and subsequent manufacturing stages. A communication processor allows the easy connection to a higher level process controller. Also, today electronic reporting and remote trouble shooting are already common features of the Walther Trowal equipment.

## Maintenance

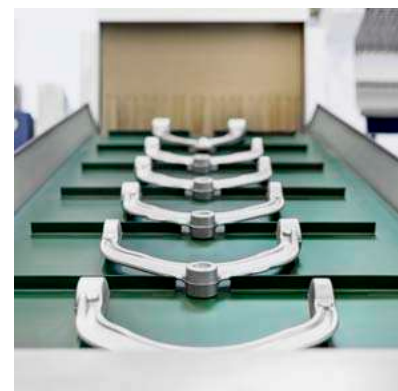
A clever rail system allows easy access to all critical wear areas of the work piece transport system: The complete troughed belt mechanism is simply pulled out of the machine housing. With such an easy accessibility maintenance work that takes days in conventional shot blast machines can be completed within just a few hours.

### WORK PIECE LOADING AND UNLOADING DEVICES

For facilitating the integration of our shot blast machines into linked manufacturing processes we offer various material handling systems like:

- Lift & tip loading systems for different work piece bins and weight capacities
- Vibratory buffers and feeding units
- Conveyor belts for loading/unloading and intermediate storage of the work pieces
- Rotary tables for the intermediate storage of shot blasted work pieces
- Tilttable backfill systems for the gentle loading of transport bins with shot blasted work pieces

All these systems can be combined into different modules allowing the operation of the shot blast machine with one single person.



Work pieces on the loading belt



Steering knuckles

## Safety

Shot blasting operations involving aluminum require certain safety precautions. For example, the dust of the aluminum fines from the work pieces and the media in the exhaust air cannot exceed a certain concentration level, because this poses a high explosion risk.

With many design details the Walther Trowal engineers make sure that only small dust amounts are created and deposited in the shot blast machine. A good example are vibratory conveyors for transporting the blast media. They are designed such that no dust pockets can be generated on the equipment. Furthermore, the exhaust air is cleaned in special dust collectors. And above all, the air flow speed in the air ducts and the shot blast machine is continuously monitored.

## Processing trials guarantee process safety

New work pieces always require processing trials. Upon request these can be conducted by the Walther Trowal specialists in the Trowal test center in Haan. During these trials the optimal processing parameters are determined. For example, the speed of the troughed belt, the turbine RPM, the blast media type and quantity or the optimum work piece quantity to be processed per minute or hour. Once all these parameters have been established, they are stored in the recipe administration of the machine controls.

For the next shot blasting job with the same work pieces these parameters can be simply called up with the touch panel. This guarantees an excellent repeatability of the entire process. Since they are stored in the machine controls, the parameters of all processes run in the past are available. This way every single work piece batch run in the past can be traced.

## MASS FINISHING OR SHOT BLASTING?

Whether a product should be treated by mass finishing or shot blasting, depends on various technical factors.

Mass finishing generates a very smooth surface finish, up to a high-gloss mirror polish. Mass finishing also allows the radiusing of edges with a precise and absolutely repeatable radius.

Shot blasting allows the fast and economical de-flashing/deburring and de-scaling. Shot blasting generates a somewhat rougher surface than mass finishing.

## THE ADVANTAGES AT A GLANCE

- Higher work piece throughput in top quality, higher profitability
- Integrated manufacturing processes
- Less maintenance work
- High uptime of the blast turbines
- Low blast media costs because of low media consumption
- Low energy consumption

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