

COATING OF MASS PRODUCED SMALL PARTS

That's how it works

Coating of small parts in a rotary drum, in short “drum coating”, had its origin in the pharmaceutical industry. There rotary drums – so-called film coaters – are utilized to place various coatings, for example a sugar coating, on all kinds of pills.

At the time film coaters were introduced for the pharmaceutical industry, the coating of small mass-produced parts from other industries was still complicated and expensive: For example, the push buttons of dish washers and washing machines had to be individually glued on cardboard for getting coated. Afterwards, they had to be carefully separated and controlled, before they could be packaged and shipped.

For this reason, in the 1990's Walther Trowal adapted the drum coating technology to mass produced industrial small parts by developing the Rotamat system. Initially, drum coating was limited to placing a lacquer or primer on pre-heated metallic components. Over the years, in close co-operation with forward-looking, innovative customers, Walther Trowal refined the drum coating technology to a point, where it has now become the generally accepted coating method for metallic and non-metallic substrates.

Today, the Rotamat represents the most cost-effective solution for the surface refinement of mass produced parts like O-rings, handles, springs or screws. Rotamat systems can handle a broad range of parts made from metal, wood, rubber and all kinds of plastic.

This includes parts for such diverse industries like automotive and cosmetics, components for writing utensils, toys and clothing accessories as well as sealing and dampening elements. The Rotamat technology allows the use of water- as well as solvent-based lacquers.

The coating of wooden toys is extremely sturdy allowing them to be used for generations.

How it works!

The Rotamat system utilizes a closed rotating drum, in which large quantities of small parts are heated and coated. That is why it is frequently called a "hot drum" coating system.

During the coating process hot air – completely free of turbulences – is guided into the coating drum to heat up the work pieces to the required temperature. Automatic spray guns evenly apply the coating material on the work pieces, while they are gently tumbling over each other.

Upon completion of the coating process the work pieces are unloaded by tilting the drum. A post-drying operation, for example, in an oven, is not needed. Even geometrically complex and delicate parts come out of the machine individually, without sticking to each other, with an even, homogeneous surface finish and absolutely dry. They can be immediately used for any downstream manufacturing operations like assembly, etc.

The inclination of the drum can be adjusted in stepless mode within a wide angle range. The drum cover is opened mechanically.

PRECISE CONTROLS

The entire coating process is fully automated. Operator intervention is limited to loading and unloading of the drum.

One batch of loose parts is gently poured into the drum. Depending on the machine size the usable drum volume varies between 15 and 75 liters, allowing the coating of several thousand work pieces in one single batch.

During the coating operation pre-heated air is guided into the drum for heating the small parts to a temperature that

is precisely adapted to the work piece material, shape and type. The inlet air is filtered preventing dust and other particles in the ambient air from entering the drum and getting deposited on the work pieces.

The temperature of the inlet air is precisely measured, before it enters the drum. In addition, an infrared sensor monitors the temperature of the work pieces directly on their surface.

Depending on the material characteristics of the work pieces and/or the lacquer type Walther Trowal



equips all new machines with a clocked and PID control of the heating unit. The software of the equipment controls allows an easy switch from one to the other.

The PID controller manages the heat input for the inlet air in relation to the actual work piece temperature and also measures the actual air volume. This ensures that the work pieces are coated at the optimum temperature, i.e. the lacquer forms a strong adhesion with the work piece surface and dries quickly, already during the coating process. The PID controller allows the customers to use coating materials that must be kept within a tight temperature range during the coating process. Some users prefer a clock-pulse control for coating at relatively low temperatures.



The Rotamat systems can be used for coating of mass produced small parts, for example, made from elastomers (photo) or metal.

Typical coating applications are:

- **DECORATIVE COATING**
Refines the component surface with a wide range of water and solvent based cosmetic or functional lacquers as well as special single or dual component coating materials.
- **ANTI-FRICTION COATING**
Reduces the friction coefficient and prevents chattering and stick-slip effects on small parts like O-rings, all kinds of sealing components or valve shafts.
- **COATING WITH A BONDING AGENT**
Establishes a strong adhesion between the substrate and the elastomer. This applies to single and double layer systems consisting of primer and cover.
- **CORROSION PROTECTION COATING**
Applies a long-term protective coat on the work pieces without the need for any hazardous chemicals. For example, compared to dip spin coating methods the threads of small and micro screws remain open and functional.
- **INSULATION COATING**
Application of an insulating protective layer on electronic components, for example, on magnetic cores, magnetic rings and capacitor sleeves.

The inclination of the drum can be adjusted in stepless mode within a wide angle range. The drum cover is opened mechanically.



Homogeneous, even coating thickness

The HVLP automatic spray guns used in the Rotamat equipment produce very little spray mist and a minimum of overspray. With a sensor and an electro-pneumatic valve at the spray gun Walther Trowal precisely controls the volume of the coating media. This guarantees that the specified, precise quantity of spraying media reaches the work pieces at any time. The result: A highly homogeneous surface finish, even coating thickness and a long life of the applied coating material.



For unloading a pneumatic cylinder tilts the drum downwards

The drum coating with Rotamat equipment yields a coating efficiency - the amount of material applied on the part surface - of around 90%. Compared to conventional coating methods the drum coating system produces significantly less overspray. This results not only in lower costs for lacquer purchases but also for the disposal of the residual dry dust.

If needed, the Rotamat systems can also be equipped with dual spraying systems. This offers a big technical advantage, whenever the work pieces in the same drum must receive two coatings, for example, base and top coat, or primer and cover.

Intensive Cooling

Some lacquer or coating materials require a quick and, sometimes, even an abrupt cooling of the work pieces after the coating operation. For this reason, the new Rotamat machines can be equipped with a bypass for the inlet air, which upon completion of the coating process bypasses the heating unit and transports ambient air into the drum. This causes a rapid cool-down of the work pieces preventing them from sticking together and allows discharging the whole batch from the drum as individual pieces. The overall result: An extremely high ratio of "top quality" work pieces.

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Once the coating process is completed, the work pieces are discharged by automatically tilting the drum downwards with a servo motor. A post drying operation, for example, in an oven, is not required. The work pieces can be immediately used for shipping or downstream manufacturing.

Cleaning of the machines, for example, when a change of the coating material must take place, is very simple: Overspray is removed from the filters and loose paint particles are removed from the drum lid with a vacuum cleaner.

Eco-friendly operation

During the coating process the closed drum of the Rotamat systems is operating at a slight, easily adjustable negative pressure. This prevents air contaminated with solvents to escape into the environment.

All Walther Trowal Rotamat machines are equipped with a 4-stage exhaust air system including a Papp labyrinth filter, a filter mat and two pocket filters.

Simple operation

Coating recipes for different small parts and their process parameters, for example, flow rate and spray pattern of the automatic spray guns, are stored in the system controls. They are called up with a touch panel that also provides an easy-to-understand visual view of the coating process.

The coating process itself requires no operator actions whatsoever. For this reason, at some customers one operator controls and runs multiple machines. Operator actions are only required in case of unusual events like when a spray gun is plugged.

One customer found that his shift leaders, who must also take care of other machines in the same facility, only need about two hours per shift to operate two Rotamat systems. Considering that within this time frame up to 120,000 parts are coated, the personnel costs are surprisingly low! Already several years ago the same customer eliminated visual controls, because the coating quality is very high and very consistent.



O-rings are marked in different colors. To facilitate their assembly they are also coated with a lubricating lacquer.



Fish hooks are a typical example for decorative coating.



Coating gives the plastic buttons on electric appliances a metallic appearance and makes them very robust.

Safe loading

In the past, when working with solvent based lacquers, the pressure vessel containing the lacquer had to be disconnected from the material console, because it could only be opened in an explosion-proof refill room. Today, the vessel can remain at the machine or on the weighing scale, because the air is extracted, before the lid is opened. This eliminated a complete operation resulting in a significantly improved overall productivity of the Rotamat systems.



The coating gives wooden components – for example, the covers for liquor bottles or the knobs for furniture – a high-value look.

” *With this interface the Rotamat equipment can be easily integrated into interlinked processes. This represents a significant contribution towards higher efficiency along the complete coating process chain. Of course, the interface also allows remote trouble shooting by our Walther Trowal specialists.”*

Frank Siegel

sales manager „coating technology“
at Walther Trowal

Test trials provide certainty

For any new components, which a customer has not yet coated, special coating trials are conducted. Upon request such trials can take place jointly with the experts from Walther Trowal. Purpose of the trials is to determine the optimum process parameters like volume and temperature of the inlet air, drum RPM, inclination angle of the drum as well as spray volume and spray pattern of the automatic spray guns; last-but-not-least, the optimum batch size of work pieces. After a process has been established, the process parameters are stored in the recipe file of the equipment controls.

For any future coating operations with identical work pieces the recipe with the respective process parameters is simply called up. This guarantees a high process repeatability. Of course, the parameters of every coating cycle are stored in the system controls ensuring the perfect traceability of every single work piece batch that was run in the past.

Interlinked production with networked data management

Some users have linked their Rotamat equipment with the company's central computer allowing them to integrate their coating operations into the overall production control system. For example, at APO in Alsdorf all data regarding the actual production status are available in real time and can be called up by tablet or smart phone from any location within the company.

Since manufacturing operations are increasingly interlinked, Walther Trowal supplies all new Rotamat systems with an integrated OPC-UA communications module. It allows transferring process data from different machines – irrespective of the manufacturer – to higher level process control computers or to a cloud.

Lower costs

Besides the high quality and reliability of the Rotamat systems the costs are also an important factor: Many users have reported that compared to conventional coating methods with the Rotamat technology they could reduce their coating expenses to a level of 30 to 40 percent. This makes them extremely competitive and allows them to offer their products at highly favorable prices.

In addition, because of its long operational life and other factors, the Rotamat equipment has surprisingly low "costs of ownership". At one customer a machine installed in 2002 is still working reliably and cost-efficient. And this customer has no intention to replace it soon.

Also, compared to conventional coating methods, the Rotamat users could drastically reduce their personal costs. Besides loading and unloading of the work pieces into and from the drum and the occasional "trouble shooting" no other manual operations are required. Furthermore, the costs for coating material could be significantly reduced: Since the coating efficiency is about 90%, the material costs amount to 20 to 30% of the costs of conventional coating methods.

The machines

For all Rotamat machines exchange drums in different sizes can be supplied, a service that is only available from Walther Trowal. This offers a high flexibility, especially in case of different batch sizes. In addition, small sample quantities can be coated under conditions, which are identical with the actual production conditions.

The inclination angle of the drum can be adjusted within a wide scope allowing it to be adapted to different work piece geometries. This helps optimize the mixing intensity in the drum and thus optimize the exposure of the work pieces to the spray pattern of the spray guns.

Walther Trowal offers a range of machinery in different sizes:

- ⇒ **R 90 C*** [useable volume = 75 l or 100 kg of payload]
- ⇒ **R 80*** [useable volume = 50 l or 50 kg of payload]
- ⇒ **R 60** [15 l or 25 kg payload]

* Both models are equipped with programmable adjustment of the drum inclination angle by electric motor.

With 10 Rotamats the APO GmbH is operating the highest quantity of Rotamat coaters in a single plant. The company is coating about 1 billion parts annually.

Antonio Pozo

general manager at APO,
writes in a user report:

“ Since the costs for coating in Germany are now comparable to the costs of foreign job shop coaters, the Rotamat equipment allows us to enter new markets with simple communication, short supply chains and fast, on-time delivery.”



Screw bit in different sizes are coated in different colors.



The metallic look of end caps made from plastic creates the impression of a high-value product.

Recently a new trend in equipment technology has become apparent

Machines and their components are becoming more compact. One example for this trend are motors, which, even though considerably smaller than their predecessor models, provide the same performance. Accordingly, sealing components are also becoming smaller. For example, the volume of 50,000 O-rings with an inner diameter of 3 mm and a cord width of 1 mm amounts to only 0.5 liters. Also, because of just-in-time production requirements many companies order smaller quantities per shipment.

Walther Trowal has responded to this development by adding a new member to the family of Rotamat machines, namely The R 60. The drum diameter is only 600 mm. With a maximum usable volume of 15 liters it can coat small batches of, as small as, 2 liters in the proven high quality.

Screws and rivets for the aerospace industry are coated with a corrosion protection material. In addition, they are coated in different colors for easy identification.



EXAMPLE INTERSEALS

In its plant in Capriolo in Lombardy, Italy, Interseals S.r.l. produces O-rings and custom designed Elastomer preforms and coats them with a lubrication lacquer. Among other customers these products are supplied to the automobile industry and its suppliers. Interseals also coats parts from other companies as job shop operation.

Today the Interseals plant in Capriolo is operating three R 90 Rotamat machines (usable volume = 50 liters) and one R 90 C (usable volume = 75 liters). At another plant the company is operating three additional Rotamat machines. On average each one of these machines coats on average nearly 40 million parts with water based lacquers per year.

” The decision to expand our coating operation for the parts produced in-house with Rotamat machines, was a full success. Initially, the Rotamat systems were only intended for our own production. However, very quickly we received enquiries for coating job shop services from other companies. So, in the end the Rotamat units were the basis for a new, rapidly growing line of business“

Dieter Adamkiewicz

one of the founders of Interseals S.r.l.,
Capriolo/Italy

IMAGE CREDITS:
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