## Colour changes in paint shops

# Keeping wastage to a minimum

**Smaller batch sizes and special customer requirements have led to an increase in the number of colour changes in paint shops. The result is a considerable rise in the amount of paint and solvent wasted. However, the use of modern paint supply systems allows the majority of this paint and cleaning agent to be recovered. The savings made mean that the new systems pay for themselves within just a few months.**

"Only as much paint as necessary" should be the motto of all coating companies who want to ensure that their production processes are cost-effective. However, making economical use of paint and solvents is becoming an increasing challenge, because in recent years the standards which coating companies have to meet have risen significantly.

In the automotive industry and in other sectors a much wider range of colours is being used. Because of smaller batch sizes and changing production sequences at the end customer's plant, coating companies are being forced to make frequent colour changes. This results in a considerable amount of paint being wasted, which then has to be disposed of.

The same applies to the solvents needed to rinse out the paint pipes. Just-in-time delivery, which many customers require, has also increased the pressure. It is no longer possible to paint a large batch of components in one colour and keep some in stock. Instead, the coating company must respond extremely quickly and flexibly to customers' requirements at the same time as the number of colours being used is growing exponentially.

It is no longer unusual for a company operating 3 shifts to have 30 or more colour changes in the spray booth every day. Another problem is the fact that the rise in the consumption of paint and solvent-based rinsing agents causes an increase in the coating company's usage of VOCs. If company exceeds the legal limits for VOCs, it may even be shut down in the last resort.

### Piggable paint supply systems bring a significant reduction in costs

Practical experience has shown that the wastage in the paint supply system can be reduced significantly with the use of intelligent solutions, even in the case of frequent colour changes. Efficient paint supply systems are now available which are not only suitable for new paint shops, but can also be retrofitted to existing ones. In addition, these systems can generally be adapted to suit individual circumstances. They also bring considerable savings by recovering the majority of the paint that would otherwise have been wasted and reducing solvent consumption. Correspondingly the systems pay for themselves quickly, sometimes in just a few months.

Lactec, for example, has developed a piggable paint supply system (EasyPig) that can be retrofitted to existing spray booths and that reduces the annual wastage costs of 400,000 euros by almost seven-eighths. In recent years, Lactec has produced a range of different pigging systems, in which pigs are pushed through the paint pipes with compressed air like items in a pneumatic dispatch system, in order to expel the paint from the supply line before the colour change and return it to the container.

Pigging systems were originally developed for recovering paint between the atomiser and the colour changer with fully automatic piggable paint hoses. Nowadays, the latest high volume paint shops, which are used to paint plastic bolt-on parts for the automotive industry, are fitted with piggable paint supply systems.

For companies which are not able to invest in a completely new paint supply system for cost reasons, the EasyPig is the ideal solution. Conventional paint lines are replaced with piggable pipes. The special feature of the EasyPig is that instead of having ten or more separate pipes for different colours, only two paint supply lines are needed: one which is used to paint the components and another which is being rinsed and prepared for the next colour.

During a colour change, the pig pushes the paint from the application system back to the container. The paint in the pipes can be reused and does not have to be disposed of. Pigging the pipes removes all the paint, so very little rinsing agent is needed for the subsequent cleaning process. Another factor also helps to reduce the amount of rinsing agent used. Instead of rinsing the pump circuit constantly with "fresh" solvent, the system is initially cleaned with "used" solvent which cuts the consumption of "fresh" solvent from 30 litres to 5. As the internal diameter of the piggable pipes is only 12 mm (three-quarters the size of conventional paint lines), the capacity of the system is smaller, which saves both solvent and paint. With the EasyPig only 0.5 litres of paint is wasted per colour change instead of the usual 4 litres.

Depending on the customer's requirements, the colour change frequency and the number of colours, several EasyPig systems can be combined. The number of users and the volume of paint will also determine how many systems should be used. An analysis of the existing situation will provide an answer to this question.

| System parameters | | Small paint supply system | EasyPig |
|---|---|---|---|
| Interior diameter [mm] | | 16 | 12 |
| Length of circular pipe [m] | | 80 | 80 |
| Paint capacity [l] | | 16 | 9 |
| Paint wastage per colour change [l] | | 4 | 0.5 |
| Rinsing agent consumption [l] | | 30 | 5 |
| Production parameters | | | |
| Colour changes per day | 15 | | |
| Working days per year | 250 | | |
| Paint price per litre [euros] | 10 | | |
| Rinsing agent price per litre [euros] | 0.75 | | |
| Processing costs [euros] | 0.5 | | |
| Costs | | | |
| Paint wastage costs per year | | 150,000.00 € | 18,750.00 € |
| Rinsing agent wastage costs per year | | 84,375.00 € | 14,062.50 € |
| Paint processing costs per year | | 157,500.00 € | 19,687.50 € |
| Total wastage costs | | 391,875.00 € | 52,500.00 € |

Cost comparison between a small paint supply system and the EasyPig system. As the table shows, the introduction of the pigging system results not only in a considerable cost saving, but also keeps the consumption of solvent used to clean the paint pipes to a minimum, which has a positive impact on the company's VOC usage levels.

## Paint recirculation using compressed air

Reiter Oberflächentechnik has developed an economical paint supply system for a leading Polish bumper manufacturer. The Polish supplier paints bumpers and bolt-on parts in more than 100 colours using four robots in its base coat booth. Reductions in component batch sizes have resulted in the company incurring huge costs for colour changes in its circular paint pipe. Therefore, it commissioned Reiter to design a solution which had to meet the following requirements:

- no increase in maintenance costs
- no additional consumption costs
- payback period of no more than six months
- use of existing paints with a viscosity of 16 to 23 sec/DIN4
- colour changes in the circular pipe within a maximum of 7 minutes
- average consumption of rinsing agent of a maximum of 4 litres
- average paint wastage of 250 to 350 ml depending on viscosity

As a result of these requirements, the pigging systems commonly used in the automotive industry or other solutions with complex sensor and control functions were not an option. Therefore, the manufacturer chose a system which returns the paint from the circular pipe to the container using compressed air during colour changes. This is known as the AirMolch system.

The simple, cost-effective paint supply system automatically takes the paint out of the circular pipe during colour changes and returns it to the container. As a result, the paint wastage per colour change falls from 3 litres to 0.33 litres. The operator links the feed line to the rinsing unit. First of all the paint is removed using compressed air. This is followed by the rinse process in which the rinsing agent is pulsed through the pipes to clean them more effectively. After this, the next paint container with the new colour is connected to the system and the circular pipe is refilled.

This solution also involves recirculating the rinsing agent, which results in a reduction in wastage from 40 litres to only 3.5 litres. A central rinsing agent supply unit is used for the cleaning process and a collection tank for contaminated rinsing agent is also provided.

## Payback period of only a few months

One of the requirements of the Polish customer was that it should be possible to convert the current paint supply system with relatively little effort and that the existing colour changer should be integrated. In addition, the new colour change system had to be incorporated

| Name/description | Current system | AirMolch system | Unit |
|---|---|---|---|
| **Basic data** | | | |
| Number of colour changes per day in the special paint supply system | 15 | 15 | Number/day |
| Working days per week | 5 | 5 | Number/week |
| Working weeks per year | 45 | 45 | Number/year |
| Number of colour changes per day in the booth (3-shift operation) | 35 | 35 | Number/day |
| Length of the circular pipe | 2 x 41 | 2 x 41 | m/DN8 |
| **Colour changes in the mixing room** | | | |
| Paint wastage per colour change in the special paint supply system | 3 | 0.33 | l/kg |
| Solvent wastage per colour change in the special paint supply system | 40 | 3.5 | l |
| Colour change time in the special paint supply system | 0.75 | 0.14 | h |
| Paint wastage per year with 15 colour changes in the special paint supply system, a 5-day working week and 45 working weeks in the year | 10,125.00 | 1 113.75 | l/kg |
| Solvent wastage per year with 15 colour changes in the special paint supply system, a 5-day working week and 45 working weeks in the year | 135,000.00 | 11,812.50 | l |
| Time needed per year with 15 colour changes in the special paint supply system, a 5-day working week and 45 working weeks in the year | 2 531.25 | 472.50 | h |
| **Costs per colour change** | | | |
| Cost of paint wastage per colour change in the special paint supply system | 60 | 6.60 | € |
| Cost of solvent wastage per colour change in the special paint supply system | 54.4 | 4.76 | € |
| Cost of time needed for colour changes in the special paint supply system | 3.07 | 0.57 | € |
| **Costs per year** | | | |
| Cost of paint wastage per year with 15 colour changes in the special paint supply system, a 5-day working week and 45 working weeks in the year | 202,500.00 | 22,275.00 | € |
| Cost of solvent wastage per year with 15 colour changes in the special paint supply system, a 5-day working week and 45 working weeks in the year | 183,600.00 | 16,065.00 | € |
| Cost of time needed per year with 15 colour changes in the special paint supply system, a 5-day working week and 45 working weeks in the year | 10,361.00 | 1 923.75 | € |
| Paint costs | 20.00 | | €/kg |
| Solvent costs | 1.36 | | €/l |
| Staff costs | 4.10 | | €/h |

Paint supply systems powered by compressed air can bring considerable savings in paint and solvent consumption.

into the company's old programmable logic controller (PLC). All of these requirements were met. The PLC now controls the recovery and cleaning cycles automatically, on the basis of the length of the pipe and the viscosity of the paint.

The intelligent design of the system also allows the majority of the paint in the membrane pump to be recovered, which reduces paint wastage even further. As a result of the considerable savings, the system paid for itself within four months. The total cost of the Polish company's annual paint wastage resulting from 15 colour changes per day in the special paint supply system has been reduced by around 180,000 euros to only a ninth of the original amount.

Examples such as these make it clear that paint shops which are subjected to increasing pressure from customers and forced to make more and more frequent colour changes can convert their production systems in a very short time. This brings significant savings, primarily because the paint supply system can be adapted to meet each company's specific needs. The payback period is correspondingly short.

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