

# TechNews

Sumitomo (SHI) Demag

## ***Produce coloured plastic parts efficiently with the "activeColourChange" liquid colourant change system***

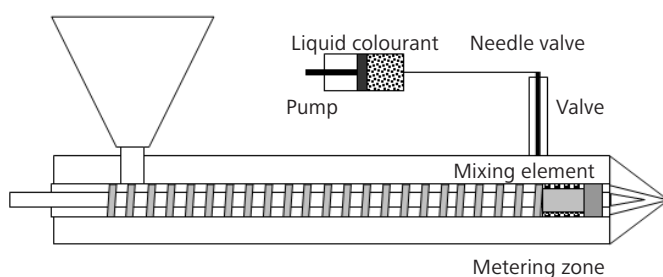
Using activeColourChange from Sumitomo (SHI) Demag means you can produce coloured plastic parts with high levels of flexibility and also cut costs in the process!

**Colouring plastic parts in a homogeneous way during the injection moulding process has posed a major challenge for a very long time. Surveys have indicated revealed that over one third of all manufactured thermoplastic products are coloured or come into direct contact with colourant, for example through a lacquering process. And the trend is increasing!**

Together with our partner companies, we have developed a liquid colourant system for injection moulding machines, which combines the advantages of liquid colourant with the advantages of standard plastification. The key core idea is that we only add the colourant to the plastic when the plastic is in a liquid state. Not only does this save time, energy and costs when changing colourants, but it also separates the melting procedure from the colouring process, and in this way enables a very consistent dosage procedure to be carried out with full plastification and without any "smearing" of the screw. And the real highlight is that you don't come into contact at all with the liquid colourant since it is a self-contained system. Just press a button and the machine automatically switches to your new shade of colour.

### How activeColourChange works

A specially developed self-contained system, specifically synchronised with the injection moulding process, injects the liquid colourant during the plastification phase in the forward area of the injection cylinder. Assisted by the endless piston principle, even the smallest amounts of colourant can be injected into the melt very consistently at counterpressure. An adjusted mixture element homogenises the compound material and makes the coloured plastic quantity available for the injection procedure.



### Usable plastics

- Generally, no limitation compared with masterbatch → highly flexible use of colour, since no carrier compatible with the plastic has to be used.
- The compatibility of the liquid colourant with the plastic that will be processed largely depends on the processing temperature. (Carrier liquidity is the limiting factor. It must be clarified with the colour supplier if using high temperature plastics such as PEEK).

### Typical areas of application

- Visible components which are frequently manufactured in different colours.
  - Pens such as highlighters, felt pens, etc.
  - Household appliance housing parts (vacuum cleaners, coffee makers, tea kettles, etc.)
  - General household goods such as laundry baskets, watering cans, buckets, etc.
  - Installation objects such as light switches, sockets, WC cisterns, etc.

### Comparison of aCC vs. with colouration via material hopper

#### Colouration via hopper

- When colouring using a hopper, the screw is contaminated with colourant along its entire length.
- In the feed and compression zones, the plastic is not completely melted → The rinsing effect of the mixture of plastic melt and unmelted granulate residues is very poor
- Poor rinsing effect in this area can lead to the screw being coated with colour particles → The colour particles then degenerate after some time. When they dissolve, they can be recognised as black spots on the part. This likewise also extends the rinsing time considerably during colour change.

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## activeColourChange

- The liquid colourant is injected into the plastification unit in the metering zone area → The screw is only contaminated with colour in one sub-area.
- Colour is only applied where the plastic has already melted. This improves the rinsing effect and reduces the length of rinsing.
- Self-contained system: The machine operator does not come into contact with the liquid colourant; no colour residues in the feeder area (as there are with liquid colourant via a hopper)
- Fully automatic colour change at the press of a button
- Shorter colour change time since the screw only comes into contact with the colourant from the metering zone forward
- Lower colour dosage is also frequently possible since the liquid colourant usually has stronger pigmentation.

## Calculation example

### Assumptions:

- Screw Ø 70 mm
- Shot weight 600 g
- Cycle time 45 s
- 320,000 shots per year (at 4,000 operating hours)
- Colour change after every 2,000 shots

### Masterbatch

- Masterbatch amount (per batch size 2,000 shots per colour): 24 kg ~ 2 %
- Loss of material through rinsing after MB dosage switched off: 50 shots ~ 30 kg
- Loss of material until components are imbued with colour again: 30 shots ~ 18 kg
- Loss in time: 19 min.
- Loss in working time: 15 min.

### Savings

1. Due to quicker and automatic colour change
- Loss of material 48 kg with masterbatch versus 24 kg with aCC
  - Cost saving of €48 with an assumed material price of €2/kg
- Loss of working time 15 min. with masterbatch versus 8 mins. with aCC
  - Cost savings of €3 at an hourly rate of €30
- Savings due to shorter colour change time not taken into account

- Material costs (plastic): €2/kg
- Colourant costs (masterbatch and liquid colourant) = €15/kg
- Colour dosage
  - 2 % masterbatch
  - 1.5 % liquid colourant
- Wage costs for machine operator = €30/hr

### activeColourChange

- Liquid colourant amount (per batch size 2,000 shots per colour): 18 kg ~ 1,5 %
- Loss of material through rinsing after the MB dosage has been switched off: 25 shots ~ 15 kg
- Loss of material until components are imbued with colour again: 15 shots ~ 9 kg
- Loss in time: 13 min.
- Loss in working time: 8 min.

2. Due to lower costs for the colourant (stronger pigmentation of the liquid colourant compared with masterbatch) → lower dosage (in the example, 2% masterbatch and 1.5% liquid colourant)
- 24 kg masterbatch versus 18 kg liquid colourant per 2,000 shots (production batch until colour change)
  - Cost savings of €90 at a price of €15/kg for masterbatch and liquid colourant

**Total: €141 per colour change**

**With 340,000 shots and 160 colour changes, that results in potential savings of > €20,000 per year!**

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## Example of colour change

Left stack: liquid colour with activeColourChange  
Right stack: Master Batch via funnel



## Advantages

- ✓ Improvement in process performance and stability:
  - No loss of performance during plastification (smearing the feed and compression zones)
  - Fewer process fluctuations and adjustments (melting occurs independently of colourant)
  - No interruption in the process; machine completes its run (colourant change at the press of a button)
- ✓ Considerably lower loss of material, since the colourant feed takes place at the front end of the plastification unit.
  - Up to 50% less loss. Precise savings potential depends on the shot weight
- ✓ Considerably quicker colourant change since less coloured material is located remains on the screw.  
(→ fewer contaminated parts)
  - Considerable reduction in the use of time. Precise time factor depends on the cycle time.
- ✓ Direct influence on the required colour of the product (→ in-line control possible)
  - Colourant quantity and process parameters can be adjusted at any time while machine is running
- ✓ Colourant mixture located directly on the machine (special colourant programmes and mixture units)
  - Immediate response possible in the event of colour deviations on the injected product
- ✓ Rinsing possible while process is running (special rinsing medium possible)
  - Critical moulds and hot runner system can be cleaned in the process
- ✓ Savings potential compared with the masterbatch versions (carrier medium)
  - Future potential of reducing the pigment carrier medium and thereby cutting costs
- ✓ Closed system ensures high degree of cleanliness

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