

SUPERNOVA

Supernova from PTS is the state-of-the-art, high-performance, odourless chemical cleaning compound for all thermoplastic process equipment available in concentrate or ready-to-use form.

Supernova grades are suited for a wide range of processing temperature conditions. It effectively removes residues of thermally degraded polymer from the screw and cylinder wall.

Many processors around the globe are improving their productivity by using Supernova for colour and material changeovers.

The material can be used in injection moulding, blow-moulding and extrusion and is absolutely odour-free, both before and during use so no special ventilation requirements are applicable.



Preventive Maintenance

The Problem

Time and material consuming colour and material changes are caused by contamination of the cylinder wall, screw, and - where applicable - the die or hot runner tools.

This contamination consists of carbonised residue of previously processed polymers.

Ever shorter production runs (per colour or per material) results in a growing number of changeovers. As a consequence, the problem of cleaning becomes increasingly more important and costly.

The Analysis

All plastics will deteriorate, some faster than others, some stickier than others. The short term effect is a brown gel. On the medium term, a darkening layer will deposit and on the long term a charred, fully carbonised layer will develop on the screw and cylinder.

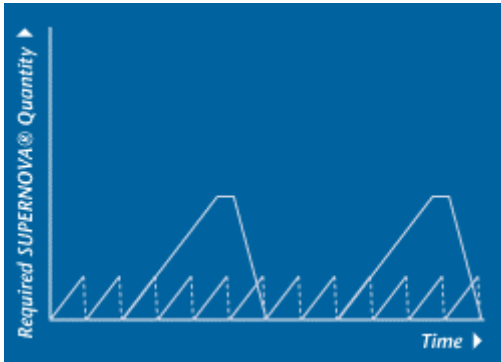
The Solution

With regular preventive cleaning - preferably after each run - carbonised residues in the form of black specks do not get the opportunity to develop. This virtually eliminates the carbonisation of the material, making the infamous black specks a thing of the past.

The Effects

Fast and easy cleaning using a small amount of Supernova means:

- much faster changeovers - reduced material loss
- increased productivity - less time lost (man and machine hours) and less rejects
- better productivity of your machinery



This graph shows how the Supernova preventive maintenance system is significantly more cost effective than the "long interval cleaning procedure".

How It Works

When introduced to the system, the cleaning compound causes a series of chemical reactions. This **odour-free chemical process** removes the thermoplastic residues from the cylinder wall and screw (including those difficult-to-get-at corners). These residues are then removed fast and easily by the **gently polishing and purging components** of Supernova.

Supernova is non-abrasive and will not damage aluminium, copper and steel finishes. During the process only very small quantities of carbon dioxide and water vapour are released. All the ingredients of Supernova are classified as "GRAS" (Generally Recognised as Safe) by the FDA and they have no potential for harming the environment before, during or after use.

After Supernova has done its work all that is left is a residual material of a polymer filled with inert minerals. This can be disposed of as plastic waste or alternatively recycled as a mineral-filled plastic.

The Supernova pellets are handled just like production material; making feeding of systems, manually or automatically a very simple, clean and dust-free operation, not requiring complicated manipulation with liquids.

Proven, effective action

In independent, comparative tests, the Supernova Preventive Maintenance method has proven to be the most effective; both technically and financially. Supernova is used by many plastic producers and processors in the USA and Europe. Supernova is an effective cleaning compound for all thermoplastics, including many polymer blends.

How much cleaning compound do we need?

Supernova produces powerful cleaning results with a small quantity of product. However, when you conduct your first test, it is possible you break loose a large amount of contamination (in the form of carbon or degraded resin, or a trace of colour). This can be removed with one or more additional purges, so you can start your preventive maintenance program with a clean system.

Injection Moulding

The Supernova quantity needed to perform a regular cleaning depends on the machine size (clamping force):

| Machine Size (tonnes) | Supernova Quantity * | Time |
|------------------------------|-----------------------------|--------------|
| 50 | 200g | 5 – 10 mins |
| 200 | 800g | 5 – 10 mins |
| 400 | 1.8kg | 10 – 15 mins |
| 700 | 3.8kg | 10 – 15 mins |
| 1000 | 7.5kg | 20 mins |
| 1500 | 10kg | 20 mins |

*First time use of the material or extensive contamination normally requires larger amounts of material.

Extrusion

After the initial thorough cleaning procedure, the Supernova preventive maintenance system is also applicable for extrusion (film, compounding, profile, pipe, sheet and cable).

| - Single Screw Extruder, L/D 30 - | | | | - Twin Screw Extruder, L/D 40 - | | | |
|--|---------------------------------------|-------------------------|--------------------------|--|---------------------------------------|-------------------------|--------------------------|
| Screw Diameter in mm | Supernova Concentrate 25% (kg) | Polymer 75% (kg) | Total Amount (kg) | Screw Diameter in mm | Supernova Concentrate 25% (kg) | Polymer 75% (kg) | Total Amount (kg) |
| 40 | 0.20 | 0.60 | 0.80 | 30 | 0.20 | 0.60 | 0.80 |
| 50 | 0.35 | 1.05 | 1.40 | 40 | 0.50 | 1.50 | 2.00 |
| 60 | 0.60 | 1.80 | 2.40 | 50 | 0.95 | 2.85 | 3.80 |
| 70 | 1.00 | 3.00 | 4.00 | 60 | 1.65 | 4.95 | 6.60 |
| 80 | 1.50 | 4.50 | 6.00 | 70 | 2.70 | 8.10 | 10.80 |
| 90 | 2.00 | 6.00 | 8.00 | 80 | 3.90 | 11.70 | 15.60 |
| 100 | 2.80 | 8.40 | 11.20 | 90 | 5.90 | 17.70 | 23.60 |
| 120 | 4.80 | 14.40 | 19.20 | 100 | 7.80 | 23.40 | 31.20 |
| 150 | 9.50 | 28.50 | 38.00 | 120 | 13.50 | 40.50 | 54.00 |
| 200 | 22.50 | 67.50 | 90.00 | 130 | 17.20 | 51.60 | 68.80 |
| | | | | 150 | 25.70 | 77.10 | 102.80 |

Note: This calculation is based upon material needed in regular use of Supernova (1.5 the cylinder content). First time use of the material or extensive contamination normally requires larger amounts of material.

Note: In extrusion equipment the die represents a variable volume of material. Therefore the above indicated amounts must be multiplied with the following factors for different types of extrusion processes.

| Process Factor | Multiplication Factor |
|---------------------------|------------------------------|
| Compounding | 1.0 – 1.2 |
| Small Sheet/Film Extruder | 2.0 |
| Large Sheet/Film Extruder | 1.5 – 1.7 |

Ready to Use Grades

| Supernova Grade | Processing Temperature | Key Characteristics |
|------------------------|-------------------------------|---|
| LTF | 120 – 220°C | LDPE MFI>6, EVOH, low viscosity and flexible plastics. eg. TPE, EVA, Flexible PVC etc |
| LTH | 120 – 220°C | LDPE MFI<6, for harder, non-flexible plastics. eg. Rigid PVC, CAB, LDPE etc |
| ST | 220 – 320°C | HDPE MFI>0.7 eg ABS, PE, PP, PS, PC, PA, PBT/PET, PVC, PU, PMMA, Acetate, Butyrate, POM, Noryl, SAN, TPE/TPR etc |
| HT | 320 – 420°C | For high temperature and high viscosity plastics. eg. HDPE (MFI< 0.7), PP (MFI<5), Rigid PVC (shore D 80 and above), Fluoropolymers, Filled Noryl Grades etc |

Concentrate Grades

| Supernova Grade | Processing Temperature | Key Characteristics |
|------------------------|-------------------------------|--|
| LT | 120 – 220°C | For all thermoplastic materials |
| CC | 150 – 420°C | For all thermoplastic materials (including Ultem, PEEK and Polysulphone) |
| CX | - | Specially design for glass-clear polycarbonate |

NOTE: The Concentrate Grades are to be mixed in with carrier polymer by the user.

Instructions for Use

Ready to Use Grades

Injection Moulding

1. Empty the machine of the production resin, raise nozzle and front zone temperature about 10-15°C above production temperature. (Do not exceed the safe processing temperature of the production resin). Remove the hopper or feed system and make sure all production material is cleaned out of the feed area.

2. Flush the machine by running clean natural HDPE or a polymer of a higher viscosity than the material to be removed (quantity 1-4 times the nett cylinder content) to push most of the residual production resin out of the machine. Run the machine empty again (optional).

3. Load the machine with a full system volume of Supernova, feeding it directly into the throat. Fill the system until Supernova extrudes from the nozzle, keep the throat opening filled with Supernova.

4. Soak the system with the screw stopped for 10 to 20 minutes. Keep the throat full, reciprocating screws forward. Supernova will "droll" from the nozzle (the gas pressures of the chemical reaction are pushing it out). If the drooling stops, jog the screw to restore drooling, top off the throat with Supernova and keep reciprocating screws forward. In the case of a shut-off nozzle: open the nozzle occasionally to prevent excessive pressure in cylinder.

5. Purge the system empty of the Supernova material. If many black specks are seen as the last of the Supernova empties from the machine, another cleaning is needed. Raise the nozzle and front temperature another 10°C and repeat steps 3 and 4.

6. After setting the required temperature profile run the new production material through the system until all traces of Supernova are removed and start up with normal production.

Extrusion

1. Empty the extruder of the production resin. Remove screen packs for the purge if possible. **DO NOT REMOVE THE DIE.** Raise temperature of the front zone and the die about 35°C above production temperature. (Do not exceed the safe processing temperature of the production resin). Make sure any venting and/or vacuum openings are closed.

2. Flush the machine by running clean natural HDPE or carrier polymer (quantity 1-4 times system volume) to push most of the residual production resin out of the machine. Run the machine empty again (optional).

3. Load the machine with Supernova, feeding it directly into the throat. Fill the system until Supernova mixture is seen emerging uniformly from the die.

4. Soak the system with the screw turning at minimum RPM for 10-15 minutes. Keep the throat full of Supernova.

5. Purge the system empty. If the Supernova still contains black specks, another cleaning is needed. Raise nozzle and front zone temperature another 10°C and repeat steps 3 and 4.

6. After setting the desired temperature profile run the new production material through the system until all traces of Supernova are removed and start up with normal production.

Concentrated Grades

Preparation of Compound – Mix Supernova concentrate with carrier polymer of correct MFI in a ratio of 40% Supernova/60% carrier polymer. Increase (or decrease) ratio if more (or less) chemical activity is required. For Supernova CX: 40% CX/60% PC.

Injection Moulding

1. Empty the machine of the production resin, raise nozzle and front zone temperature about 10-15°C above production temperature. (Do not exceed the safe processing temperature of the production resin). Remove the hopper or feed system and make sure all production material is cleaned out of the feed area.

2. Flush the machine by running clean natural HDPE or a polymer of a higher viscosity than the material to be removed (quantity 1-4 times the nett cylinder content) to push most of the residual production resin out of the machine. Run the machine empty again (optional, not applicable for Supernova CX).

3. Load the machine with a full system volume of Supernova, feeding it directly into the throat. Fill the system until Supernova extrudes from the nozzle, keep the throat opening filled with Supernova.

4. Soak the system with the screw stopped for 10 to 20 minutes. Keep the throat full, reciprocating screws forward. Supernova will "driool" from the nozzle (the gas pressures of the chemical reaction are pushing it out). If the drooling stops, jog the screw to restore drooling, top off the throat with Supernova and keep reciprocating screws forward. In the case of a shut-off nozzle: open the nozzle occasionally to prevent excessive pressure in cylinder.

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