Commonly used across the thermoplastics processing industry, purging compound manufacturers are now turning their attention to the compounding sector. **Mark Holmes** reports

Purging compounds clean up

Purging compounds are widely used across the thermoplastics processing industry where traditional cleaning methods, such as running through virgin resin or regrind, are giving way to use of specially formulated purging compounds. The prime benefit is maintaining uptime through faster changeovers. However, well designed purging compounds also more effectively remove carbon deposits, avoiding the need to remove and clean screws in sensitive production applications. Purging compound developers continue to develop more effective purging solutions for these mainstream processing applications, but are now also turning their attention to the compounding industry, formulating grades that meet the specific requirements of compound and masterbatch production.

Key areas presenting challenges to compounders and masterbatchers today include specialty compounds for automotive applications and masterbatches with unique colorants and additives, according to Eric Procunier, Product Development Manager at purging compound developer **Asaclean-Sun Plastech**, part of the Asahi Kasei Group. "Vibrant neon colours and flame retardants, for example, are very difficult to purge without using commercial purging compounds. In addition, low temperature bio-resins are gaining popularity. The temperatures that the materials process at are often lower than most current purging compounds recommended usage temperatures. Chemical purges can be difficult to activate at low temperatures, whereas glass-filled mechanical grades tend to thrive in these environments."

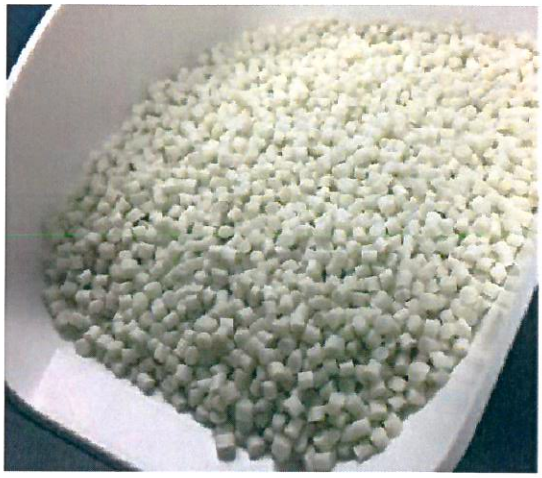
Purging compounds fall into two main categories, defined by their mode of action. Mechanical purging compounds work through shear force and material viscosity difference. They can be formulated to have an affinity for carbon deposits or particular plastic resins but basically "scrub" the equipment clean - there is no chemical reaction and no need for a "soak time". Chemical purging compounds, on the other hand, are better suited to low pressure applications and are designed to react with the plastic resin or carbon deposits to aid removal. Typically, a soak time of up to 30 minutes is required for effective use. Some systems combine both modes of operation.

PHOTO: POLYTECHS

Main image: Extruder screws can be easier to clean after pre-treatment with a suitable purging agent

The latest purging compound developments from Asaclean-Sun Plastech include Asaclean UF2, PF and PX2. The company describes the UF2 grade as a versatile, high performance purging compound particularly suited for colour and material changes for thermoplastic injection moulding, extrusion blow moulding and blown film extrusion machines. The compound can be purged through a die without removing it and effectively removes gels and contamination that is not carbonised. It is claimed to have good compatibility with polyethylene resins.

"UF2 is a very successful general use grade that has a very bright future in blow moulding because it holds the parison, and in blown-film extrusion because it is a



Right: Purging compounds from Asaclean-Sun Plastech can ease cleaning of compounding equipment running challenging formulations

very effective cleaner that holds the bubble." Procunier says. "By holding the bubble, UF2 has saved customers many hours and the cost savings have been substantial. PF and PX2 are significant because they are the two most effective high temperature purges for super engineering resins that are currently available."

The UF2 Grade purging compound is also recommended for hot runner cleaning, as well as sealing and shutting down machines to prevent carbon formation on start-up. Its processing temperature is 170-320°C.

Asaclean PF and PX2 purging compounds have been developed for thermal stability. The PF Grade purging compound is specifically formulated for super-engineering resins running at processing temperatures of up to 420°C. It is suitable for hot runner cleaning and may be used as a sealing material during machine shutdowns within temperature ranges of 280-370°C due to its thermal stability. It is particularly recommended for resins such as PPS and PEI. PX2 is also a high temperature grade for hard-to-clean resins. It is claimed to generate low levels of smoke and odour across the operating temperature range of 280-420°C and is intended for use with high-temperature resins such as PPS, PEEK, LCP and PEI.

French company **Polytechs** has developed its Clean X product range for extrusion applications. "The main markets for our extrusion grades are film and sheet, cable, pipe and colour masterbatch," says Maarten Bloem, Sales Director. "We have also introduced a product range for purging injection moulding machines, including cleaning hot runner systems. For both extrusion and injection moulding applications, we have shown that Clean X purging compounds can save time by up to 60% and up to 61% in energy."

Bloem explains that Clean X products are not only used to clean extruders but also employed as a "weekend compound" to avoid the formation of carbon deposits during machine shutdown. "When re-starting, it is then possible to produce the right formulation immediately after purging out the compound, eliminating any black speck problems. The compounds also provide protection for screw and barrel," he says.

Below: Clean X purging compound from Polytechs

"Customers are using their production lines more flexibly and therefore need our support to improve productivity by reducing downtime through cleaning. Modern equipment is now maintained in a more professional way," says Bloem. "For example, our Clean LDPE can purge and polish screws at extruder settings to 100°C. In addition, Clean LDPE can purge blown film lines without stopping the bubble when you keep the temperature settings right. Flexibility and using products in different ways are now key factors to consider when designing purging compounds."

US-based **RapidPurge** has developed more than 25 different grades of purging compounds including chemical, mechanical, chemical/mechanical formulations, and custom blends for the most demanding thermoplastic processing challenges including carbon build-up and difficult colour changeovers. The products are available in pelletised or powder form, as ready to use pre-mixes or cost-effective concentrates.

Preventing screw pulls

"RapidPurge is very effective for compounding facilities because our products can prevent the need to pull screws when switching over to the next material or colour," says Sales & Marketing Manager Mary Kinney. "In situations where you have to pull screws, using RapidPurge before teardown also makes the job much easier. Our grades are available with different polyolefin base resins to match temperature and viscosity requirements, so compounders are able to choose the best grade for specific changeovers. In addition, because all grades are available in concentrate form, some compounders prefer to tailor a purge

Right: Rapid-Purge's purging product line includes mechanical and chemical grades. This is its CC Series

by mixing our concentrate with a in-house resin."

A recent addition to RapidPur product range is the RE Series. "These purging compounds were specifically designed for medical and food applications," Kinney says. "However, its unique chemical and mechanical properties have made it popular across a wider variety of market segments than originally anticipated. These RE grades are bein used by dedicated food and medical customers with FDA/ GRAS requirements, as well as many of our non-food and medic customers. We have also introduced a speciality grade called CC3000, designed for purging clear resins. This chemical concentrate pellet can be mixed with clear resins like polycarbonate, acrylic and crystal styrene to eliminate black specks and cross-contamination from using a purge with an incompatible base resin. Mixed at / low ratio, it is extremely cost tive and can also be used as a -down aid."

apidPurge's product line ıdes chemical and mechanical les (with or without foaming) have the ability to clean down he bare metal to control carbon d-up and/or expedite difficult ngeovers. Mechanical grades available that are run through machine at operating ıperatures for quick colour and ple resin changes; mechanical centrate scrubbing pellets can ixed with virgin resin or regrind ompounder to make their own cost effective purging method. In addition, powder concentrates can be mixed with production resin for situations that do not allow a foreign resin to be introduced into the process.

Dyna-Purge says its focus is on expanding the reach of each purging compound product or grade to provide

Above: Faster purging is a key customer demand, according to Shuman Plastics, Dyna-Purge Division

more value with additional product utility. "In extrusion and compounding that means offering grades that can deliver results on a wide range of equipment, as well as to work easily at the laboratory level where benefits from purging would be beneficial too," says Kelli Ropach, International Business Manager at Shuman Plastics, Dyna-Purge Division.

"Generally, commercial purging products have addressed the bulk of compounders' needs in the commodity areas, but it is at the margins where development is evolving. Special effect pigments, high intensity colours, flame retardants, bio-fillers and bio-polymers are all driving product development, as are new high heat speciality resins. In addition, clients pushing for greater yields and productivity are demanding products that purge faster and are more self-eliminating, which is why we developed one of our newest grades, Dyna-Purge A," Ropach says.

Designed for purging polypropylene, it is the company's first purging compound to combine key features found in both mechanical and chemical products. This new hybrid technology is claimed to be ideal for eliminating colour streaks and other forms of contamination associated with purging polypropylene out of a screw and barrel (as well as the tool and die).

The compound is good for colour changes, preventative machine maintenance and before manual cleaning. It has been designed for purging through hot runner systems and other equipment with tight clearances. The new hybrid technology is claimed to reach all stagnation areas, breaking down the colour contamination and removing it from the machine. No soaking time or temperature alterations are required, and there are none of the noxious fumes or odours associated with some chemical purging compounds. The range of applications for Dyna-Purge A has recently been expanded to include low temperature resins, such as TPE, TPO, TPR and TPV.

Difficult solutions

Jeff Lewis, Sales and Technical Manager at US-based **Slide Products**, says there is a growing need for purging compounds that operate effectively in more difficult environments. "The constant development of plastics resins that are increasingly used for structural components mean that the additives and moulding temperatures will push purging compounds to be much more aggressive and efficient," he says.

"One of the more common questions I get asked currently regards streaking issues that come from trapped colour residue in hot runners and manifolds," Lewis says. "TPOs also get a lot of attention at the moment and the many industries they feed into. Due to their flexible nature they are extremely hard to purge at times. Combinations of aggressive chemical purges with abrasive carriers seem to be getting more common."

An example of this type of combination can be seen in Slide's Klenz purging compound, which uses a polyolefin carrier combined with an expanding chemical that can effectively clean out hot runners and manifolds without clogging. Klenz also neutralises Delrin resin vapours, according to the company.

Chem-Trend has added Lusin Clean 1100 to its range of purging compounds. The company says Lusin Clean 1100 is a universal purge compound designed to improve colour and material changes for injection moulding machines. The company says early results show the new additive can reduce the number of parts required to make a complete switch in colour or material by up to 35% and adds that scrap reductions of more 90% have been achieved by some users during the initial evaluation.

Lusin Clean 1100 is suitable for use with polyolefins and engineering plastics such as ABS, PS, PC, PC/ABS,

PHOTO: POLYTECHS

Right: Purging compounds can considerably speed colour and material changeovers

Above: UK-based Dugdale makes a range of PVC purging compounds

PMMA, POM, PET, PBT and PA. The compound is stable at temperatures up to 320°C and is safe and effective for use in screw and barrel assemblies, hot runners and gates. Chem-Trend adds that it is also extremely easy to remove from metal surfaces.

PVC purging

Requirements for PVC purging compounds reflect the general needs of the PVC compounding industry, according to Andy Tombs, PVC Business Development Manager at UK-based **Dugdale**. "Undoubtedly legislation is a key and primary driver," he says. "All innovation must operate within the letter of the law, with REACH compliant grades for both rigid and flexible PVC compounds. Secondly, product performance is a leading factor, providing performance that exceeds that of the previously lead stabilised materials. Thirdly, environmental and recycling factors continue to play a significant part in the development of the PVC industry."

As a PVC compounder, Tombs says Dugdale is active in handling both post-industrial and post-consumer recycled materials and this part of the industry is informing development of purging compounds. "The PVC processing industry in all its forms – extrusion, injection and blow moulding – currently has a very large appetite for new product development and innovation," he says. "There is a good market for advanced technology, which includes enhanced cleaning systems for whole production systems, such as extruder and injection moulding screws and barrels. PVC processors typically use our purging systems to reduce production downtime, produce less scrap and effect more efficient colour changes – all of which impact the bottom line and save money."

New technical and market needs drive demand for custom PVC compounds and this in turn raises new opportunities for developing PVC purging compounds. Tombs says the company creates in excess of 50 new PVC compounds each month and this number includes PVC purging products, which he says is an area the company intends to invest further in.

Dugdale has also developed a non-PVC thermoplastic purging compound for the general plastics processing sector – DucaPurge. "The DucaPurge compound is designed for immediate use without the need for soaking," says Tombs. "It therefore cuts clean downtime to an absolute minimum. Successfully tested by moulding and extrusion processors throughout the UK and overseas, the compound is intended to minimise scrap, reduce downtime and stoppages for cleaning or maintenance."

Click on the links for more information:

- **www.asaclean.com**
- **www.polytechs.fr**
- **www.rapidpurge.com**
- **www.dynapurge.com**
- **www.slideproducts.com**
- **www.chemtrend.com**
- **www.dugdalepvc.com**