

# Thermaspray adds Teflon™ to its surfacing offering

Chemours, the world leader in titanium technology, fluoroproducts and chemical solutions, approached South Africa-based Thermaspray, to become the sole distributor and only licenced applicator of Teflon™ coatings in Southern Africa. *MechChem Africa* talks to Adele Glennie (right), Themaspray's Teflon™ sales engineer, and Philip van Wyk (left), the company's engineering support manager, about the history, application technology and the unique combination of properties offered by genuine Teflon™ coating formulations.

**T**eflon™ was invented back in 1938 by a research chemist called Roy Plunkett while working at the DuPont's Jackson laboratory in New Jersey, USA. He was working with the fluorocarbon gas, tetrafluoroethylene (TFE, C<sub>2</sub>F<sub>4</sub>) at the time, on a DuPont joint venture to develop new refrigerants. One morning, when Plunkett and his assistant opened the valve of the TFE gas cylinder, nothing came out. After unscrewing the valve, tipping the cylinder upside down and, eventually, cutting open the cylinder, the researchers found that a waxy powder with amazing properties – most notably, a very low coefficient of friction – had formed and stuck to the inside surfaces of the cylinder. The TFE gas had polymerised to form polytetrafluoroethylene or PTFE, which was registered under the Teflon™ trademark by DuPont in 1944.

Chemours was spun off from DuPont's performance chemicals businesses in 2015, so retaining the PTFE invention claim and all of the rights associated with the Teflon™ product range. "Today, Teflon™ is not just PTFE, though. As well as PTFE, Teflon™ coating formulations also include, FEP (fluorinated

ethylene propylene), PFA (perfluoroalkoxy alkanes), ETFE (ethylene tetrafluoroethylene) and many others. Dry film and one coat options are available for these coatings, which each have a different chemical make-up enabling them to be applied via liquid or powder dispersions. Coatings can have two, three or more layers, depending on the type of Teflon™ and the application. Some coatings are FDA-approved as safe for food contact, while others are formulated to better suit chemical and industrial applications," notes Glennie.

"PTFE with PFAs, for example, are common constituents of Teflon™ formulations and are often combined to enhance non-stick properties and chemical resistance," she tells *MechChem Africa*, adding that PFA substituents also allow the polymer to be melt-processed.

Summarising the amazing and unique characteristics of Teflon™ coatings, Glennie produces a lengthy list:

- **Non-wetting:** Teflon™ coated cookware is ideal for producing sauces and gravies, for example, because none of the flavours stick to the hot surfaces so every drop of ingredients is retained in the mix.
- **Chemically inert:** As a result of the tightly packed structure and the strong bond strengths between the carbon and surrounding fluorine atoms, Teflon™ is resistant to almost all chemicals and solvents.
- **Non-stick/self-cleaning:** The tightly interlinked chain of CF<sub>2</sub> atoms results in very low Van der Waal forces between the Teflon™ surface and external substances on the surface. Water droplets, for example, will stay round and simply roll off a Teflon coated surface.
- **Heat resistant:** The surface remains fully functional at temperatures of up to 260 °C and down to as low as -200°.
- **Non-toxic and PFOA Free:** Health concerns have been raised in the past about the compound PFOA, which used to be a constituent of PTFE products, but Teflon™



has been PFOA-free since 2013.

- **Low friction/self-lubricating:** Teflon™ still has one of the lowest friction coefficients of all known solids, which makes it ideal for sliding, bearing and lubrication applications.
- **Non-flammable:** Teflon™ has virtually no hydrogen and a very high oxygen index (90) which means that combustion-based reactions cannot occur making the material inherently non-flammable.

## Industrial applications for Teflon™ coatings

The surface properties associated with the Teflon™ range make it a good fit solution for a host of industrial processes. FDA-compliant industrial bakeware is routinely Teflon coated for the hygienic advantages of easy clean-in-place and low product entrapment. Teflon™ -coated bakery equipment such as hoppers, conveyors, mixers, cookware and food processing equipment surfaces offer minimum possible surface friction and maximum corrosion resistance, while ensuring contamination-free processing.

"Chemours has long been the go to coating company for global industrial bakeware and enjoys high percentages of the market. Bakeware is our key market in South Africa, too, and we have already secured the business of one of the key fabricators of equipment for the bread baking industry," Glennie tells *MechChem Africa*.

"We are now coating new and refurbished trays and conveyors and striving to educate end-users about what they are getting. In the past, local baking equipment was coated with a mish-mash of other imported products that could be non-approved and inferior. Teflon™ was not being used.

"Chemours will guarantee the number of lifecycles for a Teflon™-coated bread tray, for example. There are many different sizes of bread trays and each has a number of pans in a strap. By choosing the most appropriate genuine Teflon™ formulation, the bakery is

assured that the minimum specified life will be achieved," she says, adding, "and once this life has been reached, the whole strap can be returned to us, stripped down and recoated, giving a second and third guaranteed life."

In addition, Teflon™ formulations are custom designed to suit the application, raising the cleanliness levels of the facility, most notably with respect to oil. "Oil gets everywhere and when baked it can leave a black residue that compromises the end quality of the bread – and once on a pan, this residue will compromise the quality of every subsequent bake".

"By using Teflon™, far less release agent is required, which is already a cost saving; the residue problem is massively reduced; and the bread is healthier, better tasting and better looking," she informs *MechChem Africa*. In addition, maintenance is reduced and recoating times extended, all of which makes choosing Teflon™ far less risky and more cost effective than unapproved substitutes with no quality guarantees," she argues.

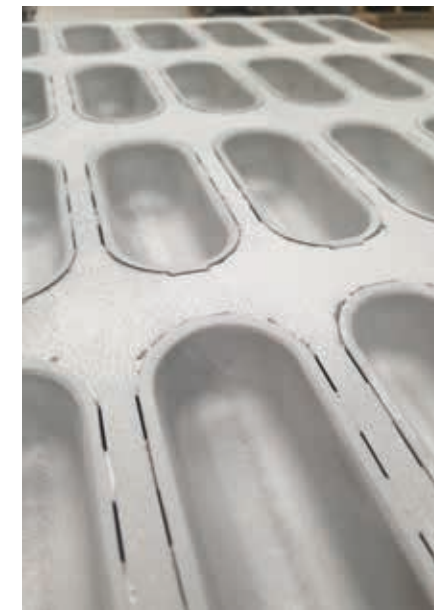
According to the bakeware coating facility in Egypt where Thermaspray received training on how to apply Teflon™ to Chemours-approved standards: "Teflon™ formulations are the best in terms of quality and value for money and they present the lowest risk to a manufacturer because of Chemours' quality guarantees and backup service," Glennie tells *MechChem Africa*.

"Most coatings available in Africa have no quality approvals of any kind. In addition, Teflon™ coatings formulations are designed to suit the exact type of bread being baked – white, brown, wholemeal or baguettes. Each bread type has a matching Teflon™ formulation, depending the sugar levels and oils being used, which again raises the effectiveness of the coating and the overall quality of the end product," she adds.

Outside of the baking industry, other industries that could benefit from genuine Teflon™ formulations include:

- The chemical and steel industries, where friction and corrosion are key reasons for adopting the material. A Teflon™ surface coating can slow down or stop the corrosive wear on hoses and other plant components, protecting the substrate and extending component life.
- Printer and textile rollers, adhesive rewinders and paper process rolls, where low-friction and non-stick properties can make for smooth and more efficient operation.
- Improving the chemical resistance of valves, pumps and impellers to corrosive media.
- For coated saw blades, which keeps blades sharp for longer while consuming less power.

Describing how coatings are done, Van



**Left:** Before applying a Teflon™ coating, baking trays must be degreased and abrasive blasted with a suitable grade of aluminium oxide. **Right:** By choosing the most appropriate genuine Teflon™ formulation to suit the product being baked, bakeries can be assured that the minimum life specified by Chemours will always be achieved.



Wyk says that many of the processes that Thermaspray already uses for its thermal spray offering are also needed, such as degreasing and abrasive blasting. "Depending on the coating used, the surface area will be blasted with a suitable grade of aluminium oxide. Teflon™ coatings adhere best when the substrate is pre-heated. Once the primer is applied, a drying process normally follows. Some processes require a midcoat with a second cure, and the final stage always involves a topcoat and a final cure.

"Teflon™ coatings are vastly different from Thermaspray's metallic and ceramic coatings, which offer a host of different kinds of protection. Thermal spray coatings and Teflon™ often combine well, however, where a dimensional build up and wear protective coating can be achieved via thermal spraying, with an additional Teflon™ coating being added for non-stick or chemical resistance," Van Wyk informs *MechChem Africa*.

Glennie continues: "There are still many myths and misconceptions about Teflon™. Many coating applicators will refer to their PTFE or non-stick coating as 'Teflon™'. But only products manufactured and distributed by Chemours may be labelled Teflon™. Everything else is a non-specific PTFE, FEP or PFA," she warns.

"Teflon™ is PFOA free and complies to strict FDA and European coating regulations in cookware and bakeware. Other products manufactured in the East and South America do not always comply to these strict standards and their manufacturing processes are not regulated.

"We at Thermaspray will be the sole distributor and the only licensed Teflon™ applicator in Southern Africa. Our manufacturing

processes are regulated to Chemours global standards, which will make us a Licensed Industrial Applicator (LIA) – and genuine Teflon™ coatings can only be applied by the LIA, which will be Thermaspray," she concludes.

## About Thermaspray

For more than twenty years Thermaspray has specialised in providing wear and corrosion resistant thermal spray coatings, plasma transferred arc cladding and refurbishment services to Original Equipment Manufacturers and end-user clients.

Thermaspray's thermal spray processes include high velocity oxy-fuel (HVOF), Plasma spray, electric arc spray, combustion wire spray, powder flame spray and spray and fuse, all performed with 6-axis robotic manipulation to ensure process repeatability. Thermal spray coatings are used to refurbish components subjected to degradation by wear, corrosion, oxidation or cavitation extending the service life and performance of components.

Thermaspray has also recently added laser cladding to the specialised services offered. Laser cladding is a process which applies a metallic overlay material to primarily metallic substrates, offering properties similar to traditional welding methods such as hardness and impact resistance. It does, however, offer benefits such as low dilution, a small heat-affected zone, and minimal heat input into the substrate. Laser cladding applications range from shafts to valves, housings, rotors and drilling stabilizers.

Other services offered include machining, grinding, diamond grinding, probe track burnishing, electrical run out measurements/reporting, finishing and super finishing. □



Hamburger baking trays coated with one of Chemours' PFA-based Teflon™ formulations.