3M™ Dyneon™ Fluoroelastomers
DSM Stanyl® Polyamide 46

Innovative development

on primer free bonding for lightweight solutions

3M

The Concept

3M™ Dyneon™ Fluoroelastomers are used extensively in various high temperature applications such as radial shaft seals. Many of these applications currently use fluoroelastomers in combination with metal components.

A new joint development concept from DSM Engineering Plastics and Dyneon, a 3M company, is broadening horizons as it offers the option to replace heavy or dense metal components in high temperature applications. This can be achieved by using the new 'primerfree' combination of DSM Stanyl® Polyamide 46 and 3M Dyneon Fluoroelastomers.

Expensive metal surface treatments, which pose potential risks to the environment and to employees, can be eliminated by replacing metal components with Stanyl. These include the removal of insert shaping scrap, mechanical surface treatments such as grinding, sandblasting, baking, and chemical surface treatment like cleaning, phosphating and primering. Using Stanyl offers improved production efficiency, freedom of design and integration of functions.

3M Dyneon Fluoroelastomers and DSM Stanyl are a proven match at processing temperatures. Typically, fluoroelastomers are molded at 180 °C and postcured at 230 °C for two to 24 hours. Stanyl, with a typical melting point of 295 °C and annealing temperature of 230 °C, can therefore be processed with Fluoroelastomers perfectly, even increasing in mechanical properties.

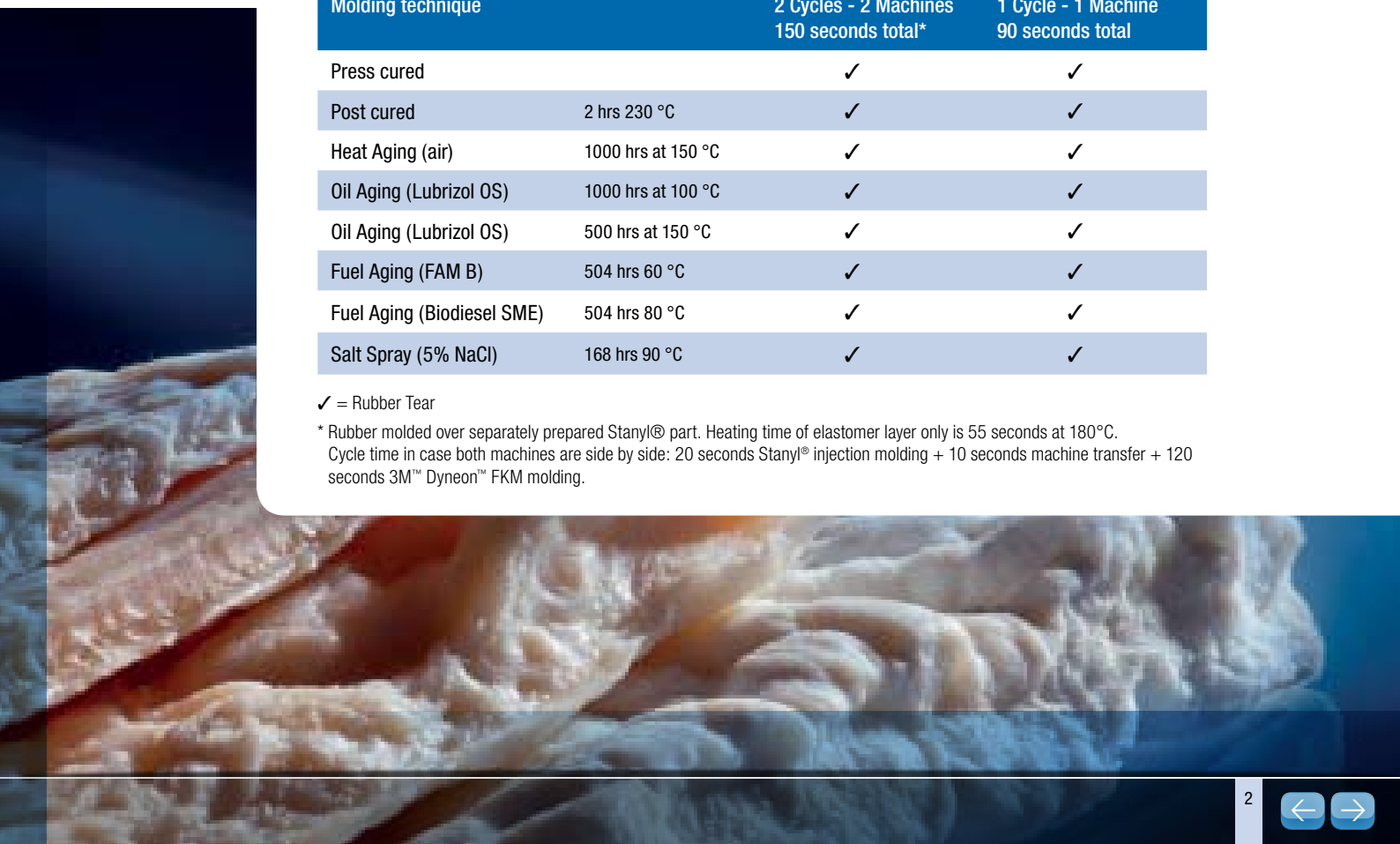
The Bonding Proof

The materials:
DSM Stanyl TW 200 F6 30% glass fiber filled & 3M™ Dyneon™ Fluoroelastomer FPO 3631 peroxide cured

Molding technique		Over Molding 2 Cycles - 2 Machines 150 seconds total*	2K Molding 1 Cycle - 1 Machine 90 seconds total
Press cured		✓	✓
Post cured	2 hrs 230 °C	✓	✓
Heat Aging (air)	1000 hrs at 150 °C	✓	✓
Oil Aging (Lubrizol OS)	1000 hrs at 100 °C	✓	✓
Oil Aging (Lubrizol OS)	500 hrs at 150 °C	✓	✓
Fuel Aging (FAM B)	504 hrs 60 °C	✓	✓
Fuel Aging (Biodiesel SME)	504 hrs 80 °C	✓	✓
Salt Spray (5% NaCl)	168 hrs 90 °C	✓	✓

✓ = Rubber Tear

* Rubber molded over separately prepared Stanyl® part. Heating time of elastomer layer only is 55 seconds at 180°C.
Cycle time in case both machines are side by side: 20 seconds Stanyl® injection molding + 10 seconds machine transfer + 120 seconds 3M™ Dyneon™ FKM molding.



Your Benefits

Weight Reduction

Density of Stanyl® (30% glass) is about 45% less than aluminium and 80% less than steel. Furthermore aluminium and metal inserts are generally overdesigned due to die-casting and stamping constraints.

✓ Part weight reductions of 40% to 50% can be achieved (even with a possible design volume increase)

✓ Supports the automotive industry's weight reduction requirements

Processing Time Saving

Surface treated metal inserts need multi-step batch processes using hazardous chemicals and associated waste streams. Planning, handling and storage of semi-finished goods last several days. The new concept provides the opportunity for:

✓ Full continuous production with Stanyl and 3M™ Dyneon™ Fluoroelastomers, in both 2K and classic overmolding processes

✓ The complete cycle time of 2K parts can become as short as three minutes. Finished post-cured parts can be ready in just over two hours.

Cost Reduction

Various insert processing steps can be eliminated:

- Steel insert stamping (or)
- Aluminium die-casting (10x tool life time extension with Stanyl)
- Mechanical and chemical surface treatments (deburring, grinding, drilling, welding, sandblasting, degreasing, phosphating and drying, primering and baking)
- Permission costs for chemical processes and waste streams
- Warehousing and transport from (external) insert supplier and treatment provider

Design Freedom and New Function

Metal stamping and aluminum die-casting processes limit design freedom for inserts.

Combining 3M Dyneon Fluoroelastomers and Stanyl opens up new opportunities to:

- Optimize current designs
- Use new assembly techniques
- Create new design concepts
- Integrate functions

Increased Sustainability

Degreasing, phosphating and chemical primering are hazardous processes. This means:

- Maintaining a safe working environment is complicated
- Chemical waste streams are dangerous
- Treatments consume a lot of energy
- Legislation and permits on the open use of these chemicals are becoming tougher

✓ With Stanyl and 3M Dyneon Fluoroelastomers no surface treatment chemicals are required anymore!

✓ Removal of all treatment processes significantly reduces energy consumption

Quality Improvement

Chemical and mechanical surface treatments are complicated to control. This means:

- Processes need to be in a separate facility and need close monitoring
- Every step in the process presents a potential quality risk
- Treated parts need to be securely protected from moisture and foreign particles
- Treated steel parts are still corrosion sensitive

✓ Surface treatment-related quality issues will disappear!

✓ Corrosion risks are removed

Technical Information and Test Data

Technical information, test data, and advice provided by Dyneon personnel are based on information and tests we believe are reliable and are intended for persons with knowledge and technical skills sufficient to analyze test types and conditions, and to handle and use raw polymers and related compounding ingredients. No license under any Dyneon or third party intellectual rights is granted or implied by virtue of this information.

General recommendations on health and safety in processing, on work hygiene and on measures to be taken in the event of accident are detailed in our material safety data sheets.

You will find further notes on the safe handling of fluoropolymers in the brochure "Guide for the safe handling of Fluoropolymers Resins" by PlasticsEurope, Box 3, B-1160 Brussels, Tel. +32 (2) 676 17 32.

The present edition replaces all previous versions. Please make sure and inquire if in doubt whether you have the latest edition.

Important Notice

All information set forth herein is based on our present state of knowledge and is intended to provide general notes regarding products and their uses. It should not therefore be construed as a guarantee of specific properties of the products described or their suitability for a particular application. Because conditions of product use are outside Dyneon's control and vary widely, user must evaluate and determine whether a Dyneon product will be suitable for user's intended application before using it. The quality of our products is warranted under our General Terms and Conditions of Sale as now are or hereafter may be in force.

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