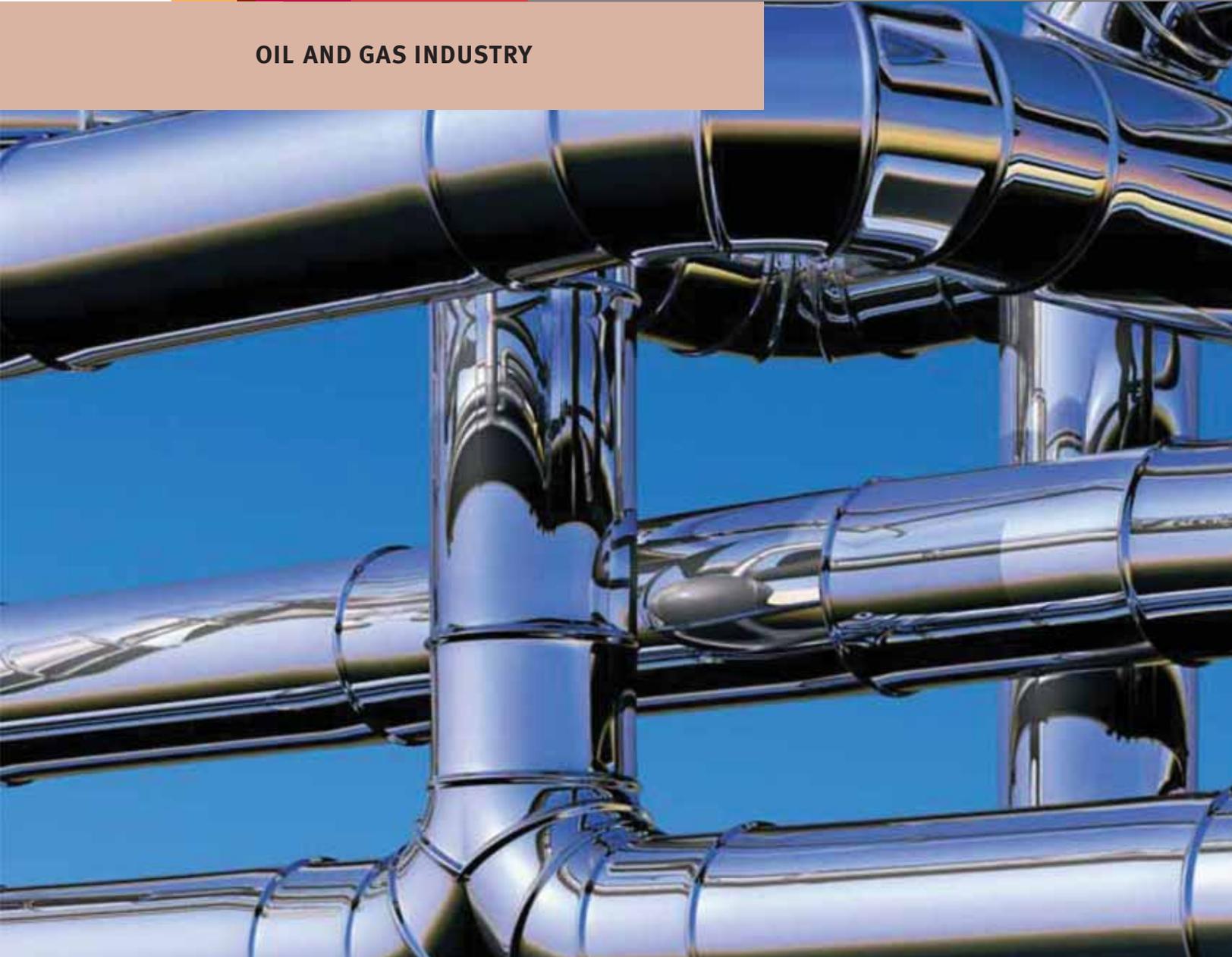


Putting science to work

PIPE SOLUTIONS

OIL AND GAS INDUSTRY



The miracles of science™

PIPES

The main tasks for the pipeline transportation are fail-safe, timely, profitable and environmentally safe oil and gas products delivery without quantity and quality losses.

DuPont provides solutions for corrosion protection, flow assurance and cost effectiveness. We offer high gloss and anti-stick internal coatings and additives for viscosity and drag reduction and cold properties improving.

As a technology leader and a strategic partner to our customers, DuPont is exploring several areas and trialing various specialized applications. We have a number of projects underway, supported by our Research & Development facilities and technical teams.





DuPont™ Nap-Gard® & DuPont™ Fusabond® Fusion bonded epoxy coatings and resins



Pipeline assets need long-term protection in demanding conditions where the costs of failure are extreme. DuPont is committed to the plant pipe-coating industry and offers the products, services, experience and technical support to help minimize most plant-applied coating and maintenance costs.

Our comprehensive line of offerings include:

- Nap-Gard® single and dual-layer Fusion Bonded Epoxy (FBE) powder coatings for corrosion-protection of oil, gas and water pipe.
- Fusabond® adhesives for bonding of PE multi-layer coating systems at operating (service) temperature up to 100°C
- Nap-Gard® high temperature (Tg) coatings developed for operating systems up to 150°C.

DuPont™ Nap-Gard® & DuPont™ Fusabond® Fusion bonded epoxy coatings and resins

NAP-GARD® FUNCTIONAL COATINGS

Nap-Gard® epoxy powder can be used as the steel primer in multi-layer polyolefin coatings; as well as their film Single and Dual layer epoxy.

It has two key roles:

- To form a continuous film with adhesion-bonding to the steel surface,
- To provide reaction sites for chemical bonding to the adhesive tie layer (Fusabond®) which ensures high peel strength adhesion results.

All multilayer systems use epoxy coatings as the corrosion protection system.

With a more than 40 year history, Nap-Gard® has been the innovator of most of the standard practices for coating pipe with epoxy used in the world today. Since 1960, Nap-Gard® FBE grades have been used from the coldest Alaskan region to the hottest Middle East region in Saudi Arabia. We also have experiences in Mexico, USA, Venezuela, Canada, Sable Island, Ecuador, Colombia, Indonesia, Turkey, Italy, etc.



DuPont™ Nap-Gard® & DuPont™ Fusabond® Fusion bonded epoxy coatings and resins

FUSABOND® RESINS

Fusabond® is the second layer of the three coat system is either applied by extrusion coating to the desired thickness or by powder spray coating.

Fusabond® grades are available to suit end use peel strength requirements and equipment process methods. Fusabond® adhesives are anhydride grafted polyolefins specially formulated for pipe coating systems and methods of application. The anhydride functional groups react with the epoxy groups in the primer to form strong chemical bonds. Single and Multi-layer systems are designed for in-plant, continuous operation for best efficiency, economics, and quality assurance of the finished coating.

The critical process steps are as follows:

1. Steel pipe surface conditioning and anchor pattern (may include surface treatment)
2. Preheating of steel to specified temperature (180°C–230°C)
3. Simultaneous coating application in proper sequence at desired thickness
4. Cooling of coating to room temperature by water quenching
5. Quality control inspection checks "Jeeping"

Steel surface preparation and conditioning prior to coating is the single most critical step in obtaining proper results from any multi-layer coating. A near white – white metal with a 2 to 3 mil anchor pattern is essential. Specific recommendations on applications with DuPont™ Nap-Gard® can be found in the Nap-Gard® technical manual.



DuPont™ StreaMax™ Coatings for downhole tubes, tools and accessories

DuPont™ StreaMax™ is a family name of fluoropolymer coatings specially developed for the oil and gas industry.

These coatings are specifically designed to:

Maximize well productivity and production rates by:

- Minimizing production interruptions by reducing the number of shutdowns for tubular clean-up.
- Significantly reducing internal buildup of asphaltenes, paraffins and scale.
- Reducing fluid flow friction in tubulars.

Maximize tubular life by minimizing corrosion from:

- Sweet and sour gases in the fluid stream.
- Bacterial accumulation inside tubulars.

Reduce overall maintenance costs:

- May permit use of common steel pipe in place of alloy steel for corrosion. Avoids lengthy delivery times for special alloys.
- Reduce risk of reservoir damage by minimizing use of chemicals and solvents.
- Minimize solvent treatment costs.

Technology Enabler:

- Marginal wells may now be more economical to operate and be more productive.

All DuPont™ StreaMax™ coatings have the following characteristics:

- Multilayered system, each layer has a specific engineered function.
- Excellent holiday free surface throughout the pipe.
- Excellent adhesion to bare metal.
- Excellent non-stick and product release properties.
- Extremely wide operating temperature range (minus 100°C to 260°C, minus 150°F to 500°F continuous operating temperature).
- Unaffected by high pressures (up to 10,000 psi).
- Excellent chemical resistance from H₂S and CO₂ gases and all acids and bases, even at high temperature.
- Very low friction coefficient.



DuPont™ Pipelon®

A unique line of engineering resins and technologies for the Oil and Gas industry



DuPont™ Pipelon® is a family of DuPont engineering polymer resins and world class technology designed to serve the demanding field of polymeric pipe solutions for the oil and gas industry. The product and technology addresses today's market for improved permeation resistance, higher temperature, higher pressure, lighter weight and lower life cycle cost pipe.

Pipelon® 401 – Properties that make it well suited for demanding applications in the oil and gas market:

Chemical resistance	Highly resistant to hydrocarbons, H ₂ S and down hole chemicals
Service temperatures	-40°C to +115°C
Permeation resistance	Low permeation to gases such as methanol, CO ₂ , H ₂ and Hydrocarbons
Mechanical reliability	High impact, fatigue, creep and stress crack resistance. High strength/ pressure tolerance, suitable for cold weather installation and handling
Durability	Excellent corrosion, erosion and abrasion resistance, and long term material stability
Potential Applications	<p>Pipelon® resins are very versatile and can be used in a number of applications:</p> <ul style="list-style-type: none"> • Down hole for siphon (velocity) and heater strings, CO₂ /chemical injection and production tube strings. Liners in steel pipe • Surface tubulars for gathering and disposal lines • Process tubulars for hydrocarbon processing, including steam • Composite pipes made of DuPont™ Kevlar® designed for high pressures, yet non-corrosive, lightweight and lower installed cost.

DuPont™ Pipelon®

A unique line of engineering resins and technologies
for the Oil and Gas industry



Reinforced Thermoplastic Pipe (RTP) Pipeline Technology



RTP is a revolutionary pipeline technology designed and specified to provide cost effective, maintenance and trouble free operation for a variety of onshore pipeline applications. RTP range of products is especially intended for those end users conscious of reducing pipeline life-cycle costs and concerned about safe environmentally sound operation.

Reinforced thermoplastic pipe is an flexible pipe consisting of three functional layers, namely:

High Performance Polymer inner liner

- Fluid seal and resistance

KEVLAR® Reinforcement

- Pressure and corrosion resistance

High Performance Polymer sheath

- White UV resistant outer layer

Applications:

On-shore: oil and gas gathering transmission and distribution, injection and disposal lines and numerous medium pressure pipe applications

Off-shore: flow, gathering, risers and injection lines

Industrial: mining industry injection lines, pumping lines, process piping, power station (fly ash pumping).

Pipe line rehabilitation: relining existing pipelines.

DuPont™ Glycolic Acid

Bactericides and oxidizers for Oil & Gas applications

DuPont™ Glycolic Acid provides low-cost metal-complexing capability in a readily biodegradable form that will not add harmful BOD or COD to formulated products.

Glycolic Acid can be used with hydrochloric or sulfamic acids to help prevent iron precipitation in cleaning operations or in water flooding. NSF-certified with low odour, low vapour pressure and non-flammability, Glycolic Acid is easy to handle and can effectively eliminate deposits.

The formula for glycolic acid is HOCH_2COOH , and the molecular weight is 76.05. The Chemical Abstracts name is “acetic acid, hydroxy” and the CAS Registry Number is 79-14-1. Glycolic acid is very soluble in water, methanol, ethanol, acetone, acetic acid, and ethyl acetate. It is slightly soluble in ethyl ether, but only sparingly soluble in hydrocarbon solvents.

Product Attributes

- low corrosivity
- negligible volatile organic compounds (VOCs)
- nonflammability
- low odour
- low toxicity
- biodegradability
- high water solubility
- dual chemistry functionality
- efficient neutralization capability
- excellent rinseability
- complexing capability
- ease of handling
- compatibility with many cleaning additives
- effective cleaner for: iron oxid, mill scale, milk stone, calcium carbonate, magnesium, manganese and copper



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