

## RILSAN® PA11—A DURABLE CHOICE FOR THE OIL & GAS INDUSTRY

The extreme conditions of oil and gas operations present their own set of challenges to the industry. Learn more about how Rilsan® PA11 has proven to be a versatile material in a variety of critical applications related to the oil and gas industry.

### Offshore Seismic Acquisition

80% of future oil and gas reserves in places such as the Gulf of Mexico lie nearly **23,000** feet below the surface, deeper than the height of **Mt. Kilimanjaro**.

23,000 feet deep

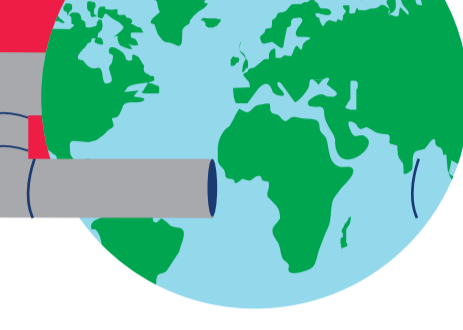
Advanced offshore seismic acquisition systems help researchers identify these hydrocarbon deposits with improved seismic data for reduced cycle time, costs and environmental risks.

Because of its **strength, durability** and **resistance** to seawater,

**Rilsan® PA11** is used in cable sheathing, air gun umbilicals, ocean bottom cables and tow cables in these innovative systems.

### Choke & Kill

The energy transportation network in the U.S. consists of over **2.6 million** miles of pipeline, enough to circle the earth over **100 times**.



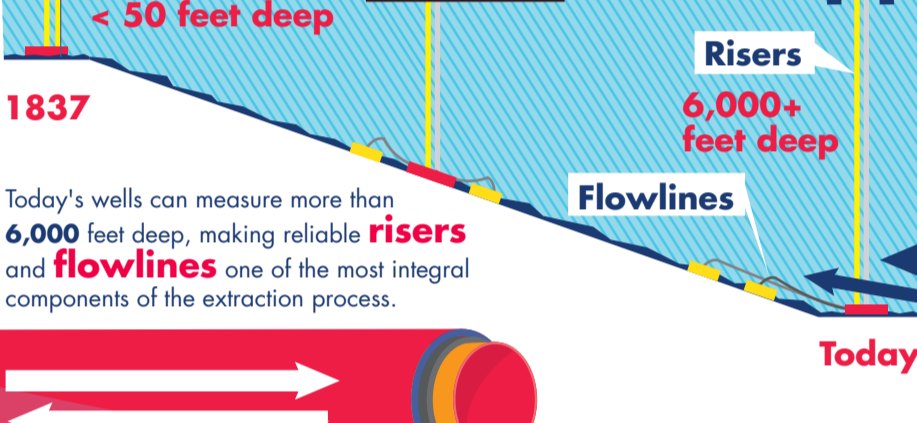
In offshore operations, part of this network consists of **Choke & Kill lines**, which are connected to the subsea BOP stack and are used to **control the pressure in the well**. In certain offshore operations, these lines can run along the outside of the drilling riser to the surface.



**Rilsan® PA11** can be used as a liner in these high pressure piping systems due to its durability in tough conditions.

### Flowlines & Risers

The first offshore well was dug in 1837 and measured less than **50** feet in the Ohio reservoir Grand Lake St. Marys.



Today's wells can measure more than **6,000** feet deep, making reliable **risers** and **flowlines** one of the most integral components of the extraction process.

Thanks to its resistance to hydrocarbons and excellent mechanical properties,

**Rilsan® PA11** is used as a liner material and the outer sheath in these critical components. Rilsan® PA11 can last up to **30 years** in these deep, subsea operating conditions.

### Umbilicals

Umbilicals are the **critical link between the surface and underwater equipment**, such as wellheads, subsea manifolds, and ROV's.

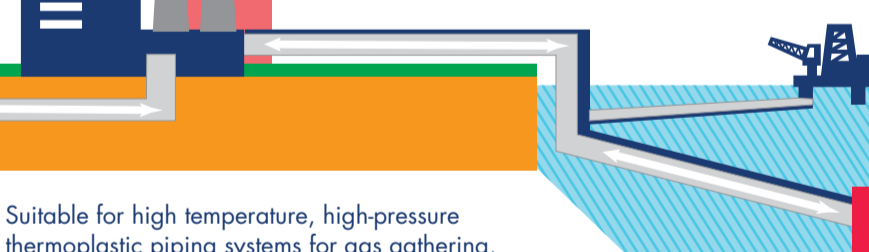
Subsea umbilicals help support drilling operations and supply control, energy and injection fluids to the well.

Because of its outstanding chemical resistance and durability, **Rilsan® PA11** is used as the liner in umbilicals to transport hydraulic and injection fluids. Rilsan® PA11 is also used in the outer sheathing protecting the bundled tubes and cables.

### Gas Gathering

There are approximately **20,000** miles of gathering pipelines in the United States, originating at over **460,000** wellheads.

Gas is pumped from these wellheads into gathering lines, which transport the gas to processing facilities, purifying and making it suitable for commercial and residential use.



Suitable for high temperature, high-pressure thermoplastic piping systems for gas gathering, **Rilsan® PA11** provides a complete system



of couplings, fittings, valves and risers. **Rilsan® PA11** SDR 11 piping operates at up to **315 psi** for unregulated gas gathering systems and is rated up to **180° F**, allowing it to be used for high temperature oil and gas transport systems.

### Distribution

Every day, **70 million** people in the U.S. rely on natural gas distribution, using **54.8 billion** cubic feet per day (56.28 trillion Btu), or enough to fill nearly **23 million shipping containers** (40' container).



**Rilsan® PA11** is corrosion free, **eliminating** the need for frequent replacements that **disrupt daily transmission and distribution**.

**Rilsan® PA11** also eliminates the need for Cathodic protection systems and provides **lower installed cost and total lifetime cost** compared to steel.

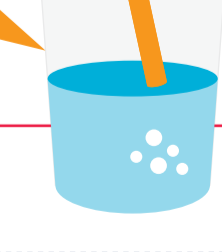


### Transmission

**Gas** is initially transported at high pressures through transmission lines, but is reduced to under **0.25 psi** upon reaching household systems.

— less than the pressure created by blowing bubbles through a straw.

Arkema's **Rilsan® PA11** grade for regulated gas transmission and distribution has been **DOT approved** in CFR 49 Part 192 for pressures up to 200 psi since December 2008.



### Sources:

- <http://www.ingaa.org/cms/15474.aspx>
- [https://www.nace.org/uploadedFiles/Corrosion\\_Central/Pipeline%20Corrosion.pdf](https://www.nace.org/uploadedFiles/Corrosion_Central/Pipeline%20Corrosion.pdf)
- [http://www.eia.gov/pub/oil\\_gas/natural\\_gas/feature\\_articles/2008/lc2008/lc2008.pdf](http://www.eia.gov/pub/oil_gas/natural_gas/feature_articles/2008/lc2008/lc2008.pdf)
- <http://www.bp.com/en/global/corporate/about-bp/bp-and-technology/more-discovery/marine-seismic-imaging.html>
- <http://opsweb.phmsa.dot.gov/pipelineforum/facts-and-stats/pipeline-101/>
- <http://www.spectraenergy.com/Natural-Gas-101/Natural-Gas-Facts/Fun-Facts-on-Natural-Gas/>

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