Thermoplastic Composites in the Oil and Gas Industry

November 6, 2018
AGENDA

• Who is Solvay?
• The Oil & Gas Industry – today and looking toward the future
• The evolution of thermoplastic composites
• The value proposition of carbon fiber thermoplastic composites
• Summary
1. 2017 underlying results
2. MTAR: Medical Treatment Accident Rate

SOLVAY IS AN ADVANCED MATERIALS & SPECIALTY CHEMICALS COMPANY

€ 10.1 billion of net sales\(^1\)

24,500 employees\(^1\)

5.53 greenhouse gas intensity kg CO\(_2\) eq. per € EBITDA

0.65 occupational accidents at Group sites per million hours worked\(^2\)

61 countries\(^1\)

124 industrial sites\(^1\)

21 major R&I centers\(^1\)

49% sustainable solutions Group net sales

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WITH A LONG STANDING SPIRIT OF INNOVATION

Solvay Physics Conferences
1911 & 1927

Solar Flight
Solar Impulse 2 accomplished the first trip around the world in 2016, without a single drop of fuel.
UNIQUELY POSITIONED TO PROVIDE THERMOPLASTIC COMPOSITES TECHNOLOGY LEADERSHIP

Key markets for thermoplastic composites

Aerospace

- Supports more cost-effective fabrication
- Enables higher build rates

Oil & Gas

- New cost effective offshore extraction
- Weight reduction and flexible pipe design optimization
- Corrosion resistance

Automotive

- Design freedom
- More efficient part assembly
- Outstanding crash & safety performance
- Improved recyclability

Broad portfolio of specialty polymers

Fiber/Resin interface

TP prepreg manufacturing

Application Engineering
Key Factors Impacting Oil Demand

- Economic Growth
- Population
- Energy Policies
- New Technologies
- Geopolitics & energy security
- Electrification of Cars
- Renewables

Economic Growth

Population

Energy Policies

New Technologies

Geopolitics & energy security

Electrification of Cars

Renewables
Having reached its peak within the next five years, DNV GL forecasts global demand for oil to be 50% of today’s production levels by 2050…however, continued investment in new oil and gas development will still be needed as global reserves decline at a rate of about 5% per year.

Source: https://eto.dnvgl.com/2018/
Electric cars are helping to transform energy use for passenger cars, slowing the pace of growth in global oil demand, however, trucks, aviation, shipping and petrochemicals keep oil on rising trend.

Source: [https://www.iea.org/weo2017/](https://www.iea.org/weo2017/)
The view from Deep Offshore…

Global Oil Supply Growth 2016-2030

- 2016 Production: 97.3 MMb/d
- Decline to 2030: -37.3
- Sanctioned Projects: 5.4
- OPEC Gulf: 2.6
- Shale Oil: 9.5
- Offshore: 15.8
- Other: 7.2
- 2030 Total Oil: 106.2

Cost Reduction

Supply & Demand Gap

Unsanctioned projects

EXCITING TIMES FOR THERMOPLASTIC COMPOSITES

Good Times in Thermoplastic Composites

March 30, 2018 by Karen Haywood Queen - Contributing Editor, Smart Manufacturing magazine

USA: Aerospace Technology

Solvay to launch PEKK Resin Production for Thermoplastic Composites

Hexcel, Arkema forge thermoplastic composites alliance

Solvay launches Evolite F1050

0 comment

Solvay launches Evolite F1050, a high-performance thermoplastic composite with continuous carbon fibre reinforcement for demanding offshore oil and gas applications, at the Offshore Technology Conference (OTC), which takes place from 30 April to 3 May in Houston, TX.

Evolite F1050 is a unidirectional tape combining the recognised chemical and temperature resistance of Solef PVDF with the inherent high strength performance of carbon fibre. It is said to offer the performance and ease of processing required by the oil and gas industry, as demonstrated by combination of mechanical and chemical resistance, high temperature applications, compatibility with ATL processes, and customised fibre/matrix translation for maximum performance, the company reports.

Airborne, Siemens and SABIC partner to mass produce thermoplastic composites

I want to say two words to you: “Thermoplastic tapes”

Japan's Toray to buy TenCate to boost carbon-fiber business

Thermoplastic composites consortium aims for high volume production for Automotive and Aerospace

Premium Aerotec presents thermoplastic CFRP A320 pressure bulkhead

TechnipFMC and Magma Global to Enter into a Strategic Collaboration Agreement for Hybrid Flexible Pipe

PEEK vs. PEKK vs. PAEK and Continuous Compression Molding
A 30 YEAR JOURNEY TO GET TO WHERE WE ARE TODAY

1980
Investigation of TPC for military applications

1990
IFP/Composite Acquitaine 4” choke & kill lines

2000
Conference on composite materials for offshore

2005
First offshore thermoset composite riser joint proven

2010
Joint Industry Program launched for deep water riser concept

Today
Release of DNV guidelines for thermoplastic composite pipes

Sources: https://www.linkedin.com/pulse/brief-history-thermoplastic-composite-pipe-marcus-kremers/; company websites
THE PRODUCT LIFE CYCLE CURVE OF CARBON FIBER THERMOPLASTIC COMPOSITES

- **Aerospace Thermoset Composites**
- **Aerospace Thermoplastic Composites**
- **O&G Thermoplastic Composites**
- **Automotive Thermoplastic Composites**
- **Epoxy**
- **PEKK, PEEK, PPS**
- **PVDF, PEEK, PPS**
- **PPA, PA6,6, PPS**
Whether in a hybrid or fully thermoplastic solution, carbon fiber thermoplastic composites enable:

- **Lower weight** versus steel, **less or no buoys** and shorter pipes
- **Reduced corrosion**
- Maintenance of excellent mechanical **performance and flexibility**
IN SUMMARY – The Oil and Gas Industry...

...is hungry for **new technologies** to bring the breakeven price as low as possible.

...has been exploring the use of composites for **>15 years**.

...understands the value proposition for using **carbon fiber thermoplastic composites** to unlock and deliver **more** value.
THANK YOU

Questions?