

Take Risk Out...
...Put **Advantex®** Glass In.



OCV™ Reinforcements

***Composites
Glass Fiber Reinforcements***

For:

**ICERP2011
MUMBAI**

March 3rd, 2011



DELIVERING SOLUTIONS ■ TRANSFORMING MARKETS ■ ENHANCING LIVES



OCV™ Reinforcements

Owens Corning At A Glance

Take Risk Out...Put **Advantex®** Glass In



- **Founded in 1938, an industry leader in glass fiber insulation, roofing and asphalt and glass fiber reinforcements**
- **2010 sales: \$5 billion**
- **15,000 employees in 28 countries**
- **FORTUNE 500 company for 56 consecutive years**



Leading North American Market Positions

- Residential Insulation
- Commercial & Industrial Insulation
- Manufactured Stone Veneer
- Residential Shingles
- Roofing Asphalts

Global Leader

- Composite Reinforcements



OCV™ Reinforcements



OCV™ Technical Fabrics



OCV™ Reinforcements

Take Risk Out...Put **Advantex®** Glass In

Owens Corning Makes & Sells Glass Fiber Reinforcements

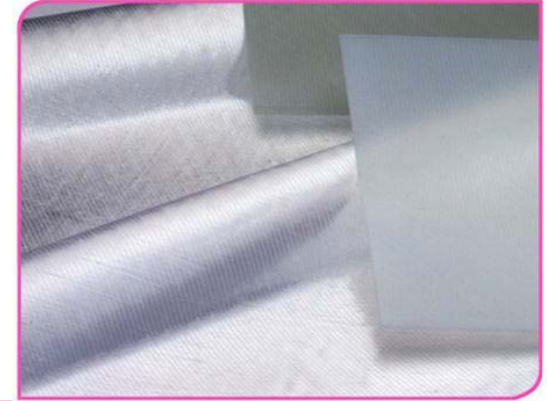
Glass Fibers



Technical Fabrics



Specialty Glass Mats



- Pioneered the use of glass as a reinforcement in composites
- Instrumental in converting applications to glass reinforced composites
- Worlds largest supplier
- Linked with 1,000's of fabricators

Our legacy of innovation continues today

1950s



1960s



1970s



1980s



1990s



Today



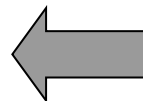


Advantex® glass is a patented corrosion resistant **E-CR** glass fiber, developed for several reasons:

- > Increased mechanical properties compared to E & E-CR glass
- > Improved corrosion resistance compared to E-glass
- > Significant improvement on the environment

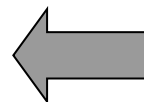
Advantex® glass meets the following glass standards :

ASTM D 578-00



States E-CR is defined by being a 100% boron-free glass composition for improved resistance to corrosion

ISO 2078



Recommends using E-CR glass in acid environments. E-glass for general purpose

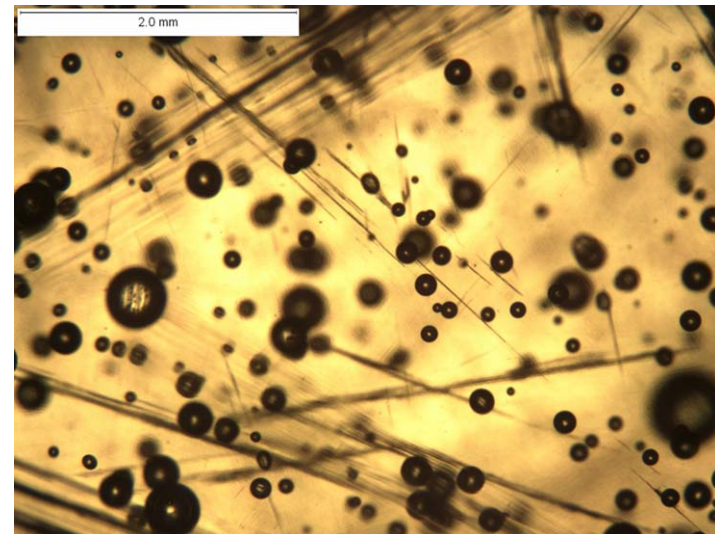
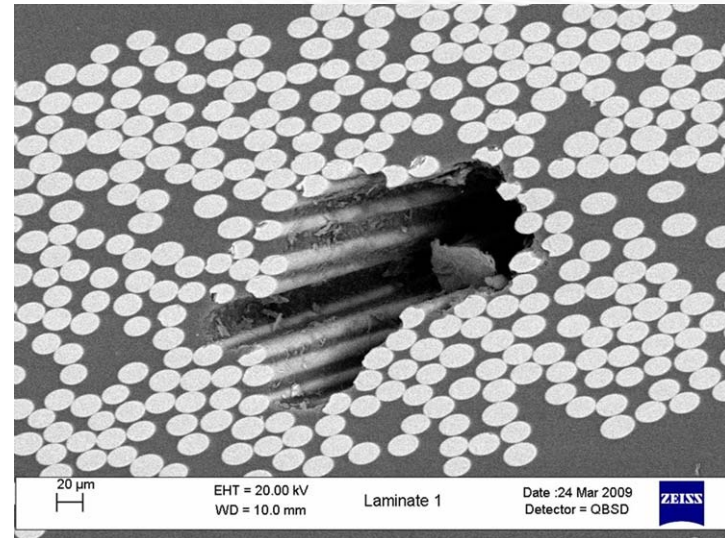


What are ways that allow the glass fiber to be attacked?

In a corrosive environment...

- Poor curing
- Diffusion
- Osmosis
- Applied stress
- Embrittlement
- Micro-cracking
- Swelling
- Impact
- Environmental cycling
- Time

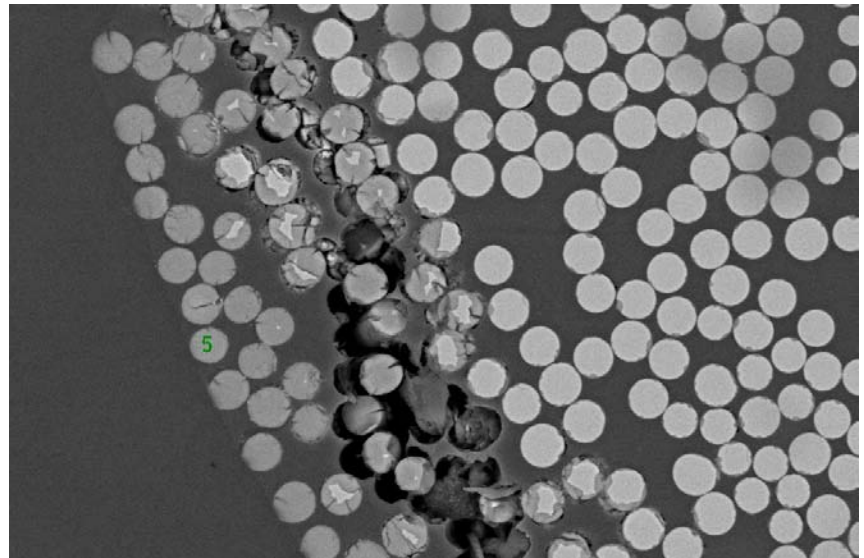
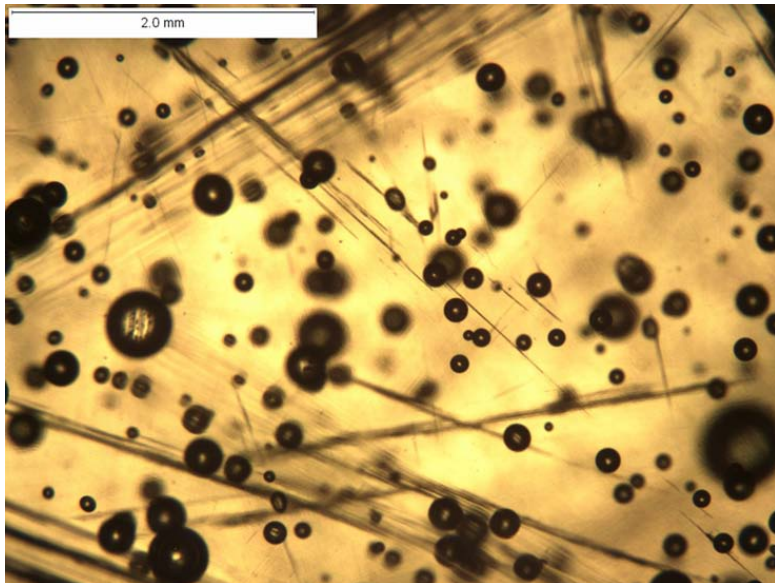
....can allow the corrosive media to reach the structural fibers.





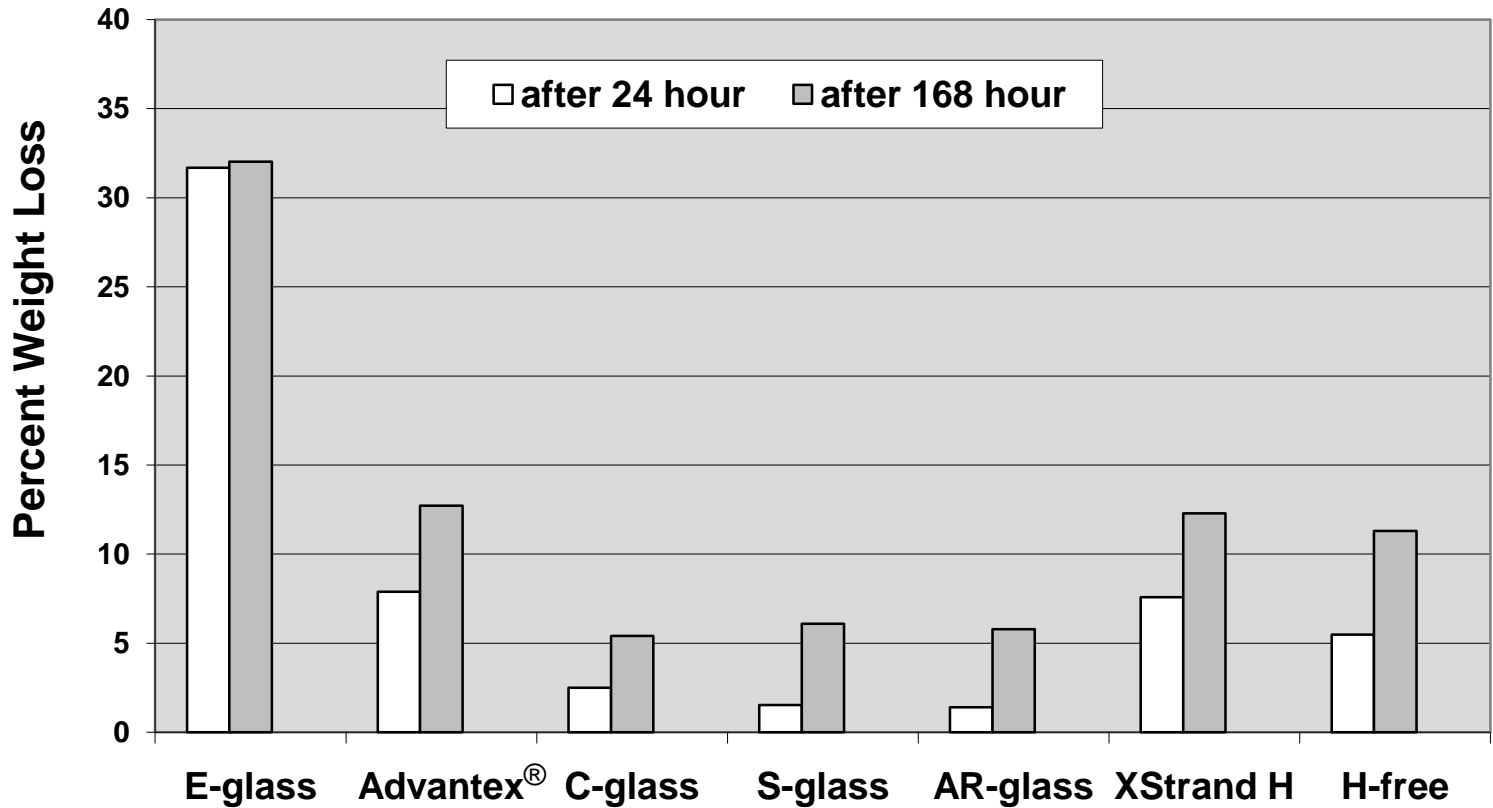
Test methods to determine performance of glass fiber reinforcements:

1. Bare glass testing
2. Stress-Corrosion tensile testing of composite rods
3. SEM/EDX (Scanning Electron Microscopy coupled with Energy Dispersive X-ray Spectrometry)



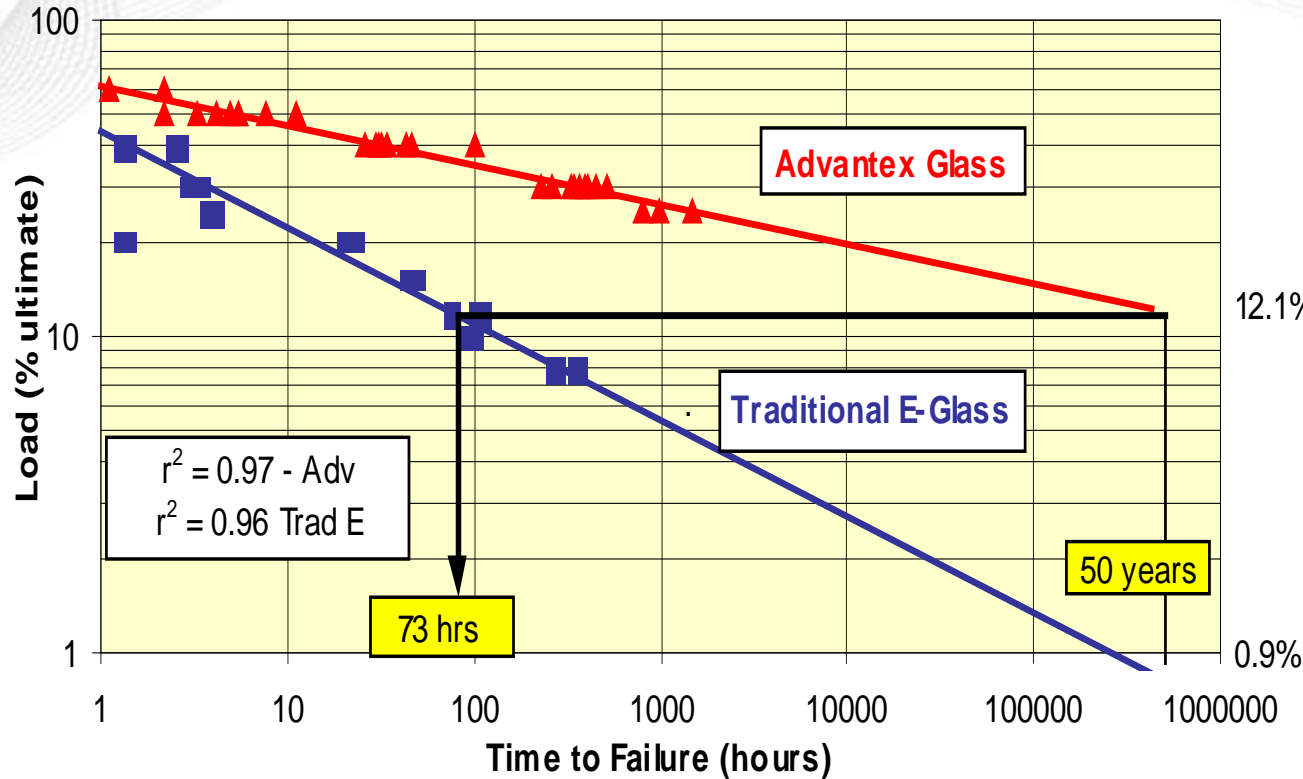


10% Hydrochloric Acid Immersion @96°C





Stress-Rupture of Composite Rods in 1 Normal Acids (HCl - H₂SO₄)



- Advantex[®] glass offers a useful stress 12 times that of a laminate made with traditional E-Glass in acid applications.

12.1% •Another way of looking at the performance differences is by noting that the traditional E-glass laminate would fail in approximately four days when stressed at the 50 year stress limit for the Advantex[®] laminate while exposed to a 10% hydrochloric acid environment.

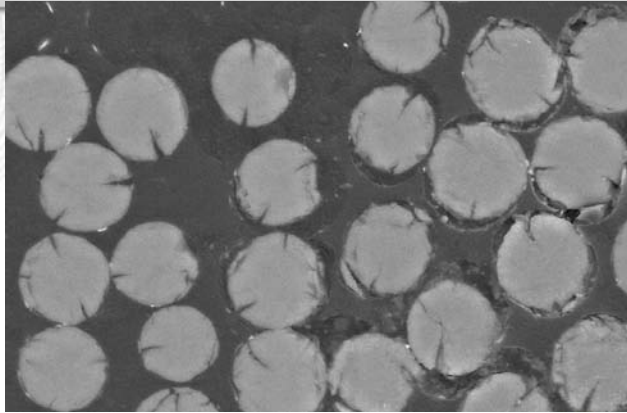




OCV™ Reinforcements

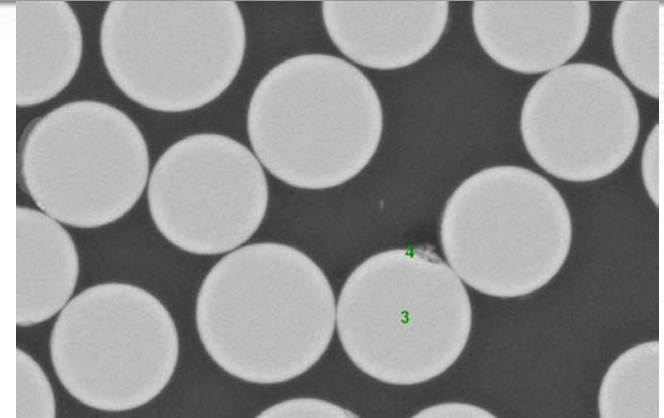
Take Risk Out...Put **Advantex®** Glass In

Advantex® glass Performs in Corrosion Even After 3 Months Exposure



10% Sulfuric Acid

E-Glass



Advantex® E-CR glass

- This microscopic view of glass fibers in the acidic media shows the degradation of the E-glass which occurs by an etching process that involves hydration followed by total dissolution of the E-glass, while Advantex remains unharmed

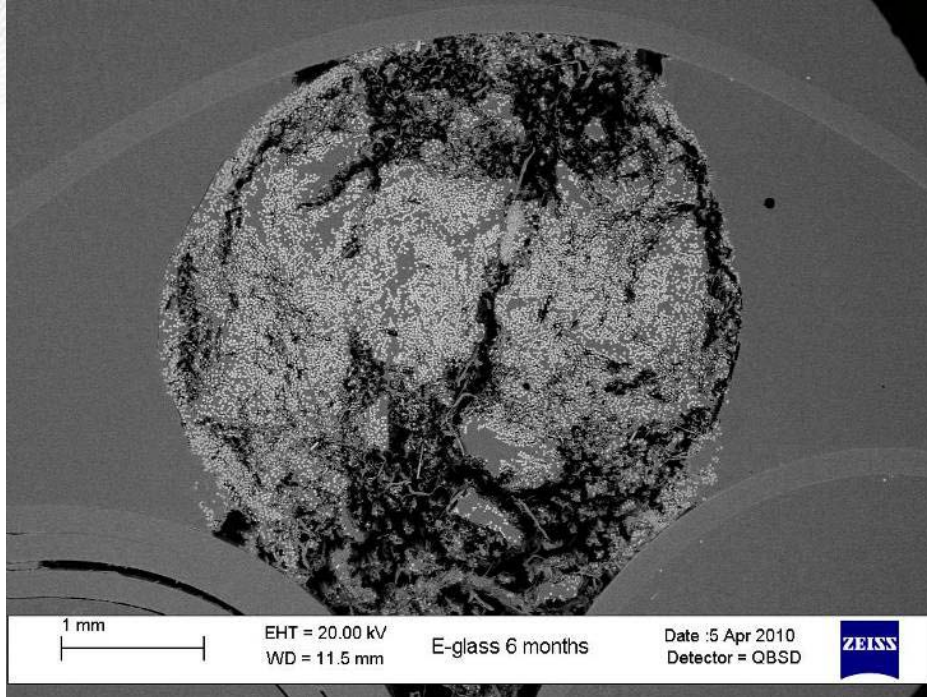
Advantex® glass continues to perform after three months with no leaching, cracking, or weakening. Maintaining its strength in a corrosive environment



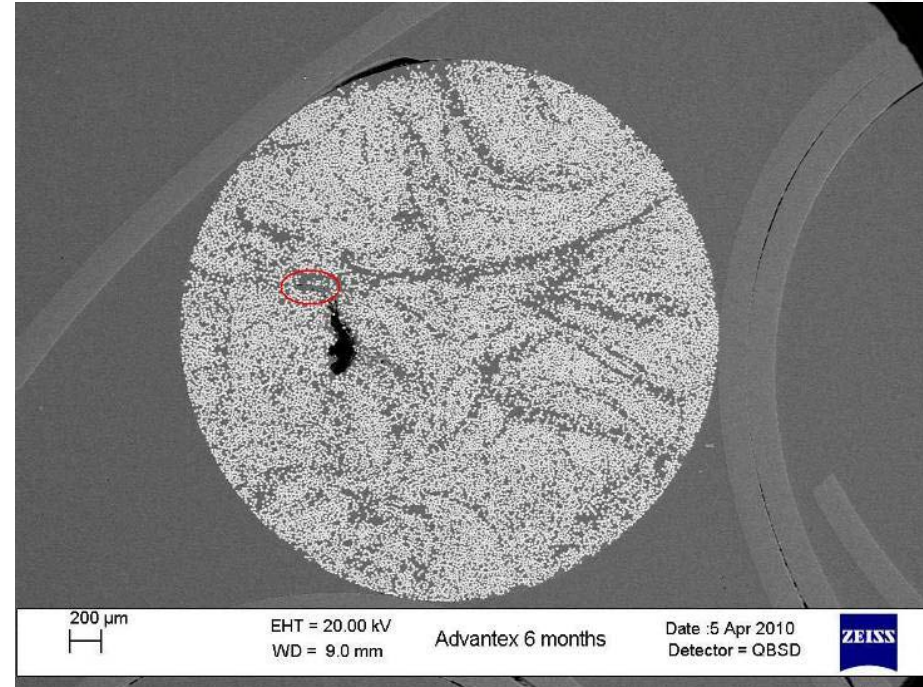
E-Glass

10% Sulfuric Acid

Advantex® E-CR glass



E-glass rod, 6 months 10% H₂SO₄



Advantex® E-CR glass rod, 6 months 10% H₂SO₄



Study Conclusion:

Advantex® fibers demonstrate superior corrosion resistance compared to E-glass when used as a reinforcement in composites exposed to corrosive environments.

Specifying **Advantex®** E-CR glass:

- Reduces risk
- Lowers maintenance costs
- Provides longer life of applications in the field
- Reduces down time
- Lowers overall lifetime cost



Courtesy of www.pitsa.com

**Combining the best suited materials will deliver:
Highest Performance, Longevity, and Reduction of Risk**



Using the best suited materials for applications facing corrosive environments is key to long-term success of those applications.

• Glass Reinforcements

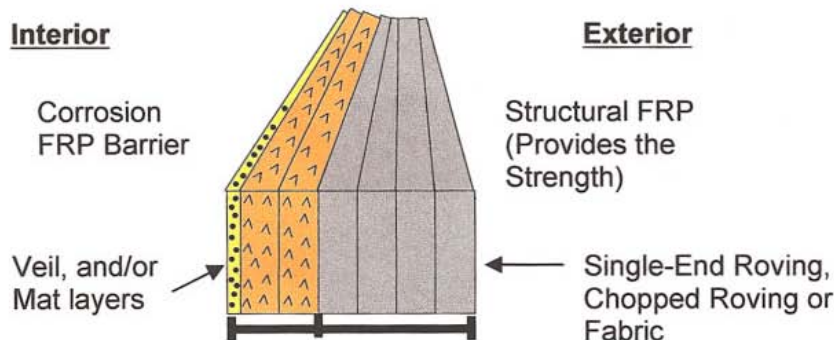
- Provides Strength and Modulus
- Orientation Maximizes Directional Properties
- Glass Type Optimizes Corrosion Performance

• Resin

- Locks fibers in place
- Determines heat resistance, flame retardance
- Certain types offer higher corrosion resistance

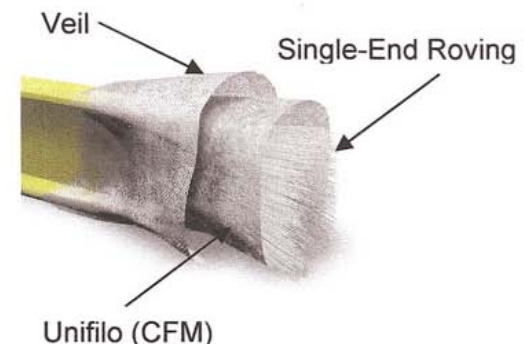
Filament Winding or Laminate

(Ex. Pipe, Tank, Ducting, etc.)



Pultruded Applications

(Ex. Grating, Railing, Structural, etc.)





OCV™ Reinforcements

PITSA Picks **Advantex®** E-CR Glass Fiber Reinforcements for Critical Project

Fabrication Process Filament winding

Resin Epoxy vinyl ester

Reinforcements

Advantex® E-CR glass fiber
reinforcements Single-end roving

Fabricated by Plasticos Industriales de Tampico (PITSA), of Tampico, Mexico.

Installation : Main island of New Caledonia in the South Pacific,

No. & size of tanks - 4 & The tanks range in diameter from 10 to 14 meters (33 to 46 feet) and in height from 8 to 18 meters (26 to 59 feet).

Chemicals stored:

Hydrochloric acid and nickel chloride at a mineral extraction plant for one of the world's largest nickel mines.



Courtesy of www.pitsafrp.com



Fabrication Process

Filament winding –continuously advancing mandrel

Resin

polyester

Reinforcements

Advantex® E-CR glass fiber reinforcements

Single-end roving

Principal markets

Water & Sewage

Industrial

Hydropower and Penstock applications



Courtesy of U.S. Composite pipe

- **NOV FGS**
 - Composite Pipe & Tank manufacturer
- **Fabrication process**
 - Filament winding
 - Centrifugal casting
- **Matrix & Reinforcements**
 - Epoxy and Vinyl ester
 - Single end roving
 - Woven roving and other fibreglass fabrics
- **Principal markets**
 - Oil field
 - Chemical and industrial
 - Marine and offshore
 - Petroleum marketing



Courtesy of NOV Fibreglass Systems



OCV™ Reinforcements

Take Risk Out...Put **Advantex®** Glass In

Put **Advantex®** E-CR glass in
composite applications

E-Glass



Advantex® E-CR glass



Thank you

For more information please visit our website:

<http://www.owenscorning.com/composites/>

Click on **Advantex®**