NEW PRODUCTION OF UNSATURATED POLYESTERS IN UKRAINE
Our production plant for the synthesis of unsaturated polyesters is strategically located in western Ukraine in Rivne.

- Kiev 320 km
- Moscow 1200 km
- Minsk 480 km
- Warsaw 450 km
- Budapest 800 km
Production start date is planned for the 4th quarter of 2011

A total of 4 reactors were constructed with a total capacity of 20,000 tons per year

Pilot plant (capacity of 50 liters) is also available
Plant scheme
– Facilities for azeotropic polycondensation polymerization
The manufacturing method is batch production

We will offer a wide range of products:

1. Unsaturated polyester resin
2. Saturated polyester resin
3. Alkyd resin
4. Acrylic resin

Unsaturated polyester
Definition:
Unsaturated polyesters are generally copolymers prepared by polymerizing one or more diol with saturated and unsaturated dicarboxylic acids (maleic acid, fumaric acid) or their anhydrides. The double bond of unsaturated polyesters reacts with a vinyl monomer mainly the styrene, resulting in a 3-D cross-linked structure. This structure acts as a thermoset. The cross-linking is initiated through an exothermic reaction involving an organic peroxide.
Unsaturated polyesters are materials that have a wide range of applications and undergoing through constant change and modification in line with market demands for more technically tailored and environmentally sensitive product

Types of unsaturated polyesters:
- According to the chemical composition and reactivity
  - orthophthalic, isophthalic, DCPD, low, medium, and high reactive...
- According to the durability that is required for the final product
  - Water resistant, acid resistant, UV resistant, thermally stable, flame retardant...
- According to the physical and chemical properties of uncured resin
  - Low viscosity, thixotropic...
- According to the field of application
  - In the construction industry, electrical industry, automobile industry, for pipe production...
- According to the method of application:
  - Hand Lay-Up, Spray Lay-up, Sheet and Bulk moulding Compound, vacuum Infusion, casting, Pultrusion...
Besides our high quality production plant, Color SIM formed sophisticated research and development department.

Our development laboratory is specifically committed to the support in:
- new products introduction
- providing the highest quality production
- technical support

Cooperation with leading universities and research institutions has been established with a commitment that innovation distinguishes every aspect of our business Process.

Developing smarter and safer solutions creates real value in new chemical applications.
General purpose unsaturated polyesters

Based on Propylene glycol and Phtalyc and Maleic anhydride

Due to its structure, this resin can be used by hand lay up, spray lay up and with casting.
Excellent wetting properties of matt and extender and resin/extender Proportion can be adjusted to the individual customer requirements.

Resin has excellent compatibility with styrene and high content of fumaric acid as unsaturation, due to the use of propylene glycol resin
General purpose unsaturated polyesters

Main applications:

- civil engineering (roof light sheet, panels…)
- automotive industry (bumpers, car-interior elements…)
- sanitary ware - bath tub
- pool lining
- shipbuilding and boat interior elements
- flower pot
- rail vehicles industry (interior elements),
Flame retardant unsaturated polyesters

Unsaturated polyester are organic compounds, and like most of organic compounds they are flammable. However, by altering their structure and / or by the use of additives or fillers it is possible to modify their burning behaviour. This enables the production of composite structures which present a reduced hazard under fire conditions.

We in Color SIM are develop flame retardant unsaturated polyester based on HET acid anhydride and on antimony trioxide.

![Chemical structure of HET anhydride and Sb$_2$O$_3$]

Polyesters based on HET anhydride can be used to produce transparent composite materials.
Flame retardant unsaturated polyesters

Fire performance is an important criterion in many of the applications in which composites are used.

Main applications:

- Electrical and lighting equipment
  (electric cabinet..)

- land transport industries,

- civil engineering

- shipbuilding
Highly resistant unsaturated polyester resins

It is possible to increase stability and chemical resistance of unsaturated polyesters by controlling their chemical structure. Color Sim will produce unsaturated polyester resin based on isophtalic acid. It is specially designed for corrosion resistant applications. It exhibits excellent mechanical properties along with good chemical resistance compared with other isophthalates and orthophthalates.

\[
\text{COOH} \quad \text{COOH} \\
\text{HOOC} \quad \text{HOOC}
\]

Isophthalic acid

Neopentyl Glycol in combination with isophtalic acid will be used to make a high performance, unsaturated polyester with even greater chemical resistance. In unsaturated polyesters, Neopentyl Glycol imparts improved hydrolytic stability, improving weathering, chemical and water resistance in end products.

\[
\text{COOH} \quad \text{HO} \quad \text{OH} \\
\text{HOOC} \quad \text{OH}
\]

Isophthalic acid  Neopentyl Glycol
Highly resistant unsaturated polyester resins

Main applications:

- chemical industry for tanks and pipelines
- for fuel tanks,
- shipbuilding, boats building
- densified solid surfaces - kitchen working tops and bar counters
- wall panels,
- pool lining
Un-reinforced polyester system

Although unsaturated polyesters were mostly used for production of composite materials reinforced with fiber glass they were also widely used in same un-reinforced application such as:
- Body filler for fast repairs and reconstruction of damaged parts and for many other repair/refurbishment applications where rapid completion is important, especially used in automobile and wood processing industry.
- For button casting
- For decorative casting (manufacture of decorative articles)

For production of body filler and kits we developed unsaturated polyester based on DCPD (dicyclopentadiene).
Thanks to its unique structure this polyester has excellent mechanical properties (this purpose required both high hardness and high elasticity), great reactivity, and excellent wetting of fillers.

Dicyclopentadiene
Unsaturated polyesters based on PET waste (PET - polyethylene terephthalate)

PET – saturated thermoplastic polyester commonly used in textile industry as synthetic fiber, in the packaging industry for beverage, food and other liquid containers and engineering resins often in combination with glass fiber.

Large amounts of PET are thrown each year as a waste - especially the PET used in packaging industry (soft drink bottles / mineral water bottles) 
There has been significant growth in recycling efforts, so PET became a useful raw material that is collected and separated from other waste to be used once again.

PET can be used in the production of unsaturated polyesters – basically everything you need to do is to insert the unsaturated unit in polymer chains of PET and chemically modify them to become soluble in styrene.
Unsaturated polyesters based on PET waste (PET - polyethylene terephthalate)

Manufacturing process:
1. PET waste is broken down into components (monomers) in a process termed “glycolysis”. Ethylene Glycols are used in this process.
2. The glycolised PET is converted to unsaturated polyester resin by reacting with Maliee Anhydride and dissolving in Styrene.

The advantages of polyesters based on PET are:
- Relatively low cost
- Terephthalic acid in the polymer chains improves the mechanical properties of composite materials made on the basis of these polyesters
- Environmental protection

The disadvantages of polyesters based on PET are the following:
- The presence of impurities (usually pigments, and other types of plastic)
- Limited solubility in styrene (in some cases)
Gelcoats and Pigmented pastes

Gelcoat is a material used to provide a high-quality finish on the visible surface of a fibre-reinforced composite material, and durability of moulded parts is very dependent on the quality of its exposed surface. Also, the appearance of those products is very dependent on quality of Gelcoats and therefore the application of appropriate gelcoats is very important. Color SIM will produce gelcoats in a large number of different shades and based on different resins depending on the needs of customers..

There are also 13 jednopigmentnih pasta design to colouring the polyesters resin and gelcoats. Pigmented pastes contain no solvent or monomer, they are based on saturated polyesters and have very long shelf life.
Conclusion:

Our extensive application development will provide:

- wide range of resins in organic solvents
- wide range of unsaturated polyester resins
- in order to fully meet our customers demands tailor-made resins can be made
- “Coynter typing”

Thank You!