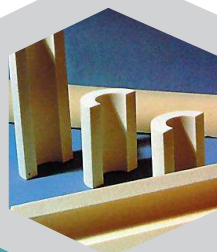
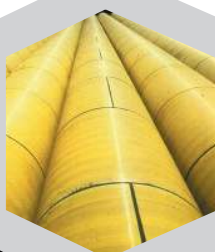


INDUSTRIAL CHEMICALS

from natural sources



Introduction



...from the field to the industrial community, renewable crops now play an important part...



The chemical industry, like many others, is undergoing a state of change as new requirements need to be fulfilled, particularly in the area of environmental policy.

In the specific area of polyurethane chemistry, answers are already available which meet the objectives of utilising environmentally friendly materials. IFS has recently introduced a new range of products which take the concept of responsible chemistry to the next level.

Historical Background

The very first polyurethane foams with blowing agents having a zero ozone depletion potential (ODP) were developed by IFS in 1988. Whilst the rest of the polyurethane industry was debating whether the foam blowing agent to replace CFCs would be HCFC 123 or HCFC 141b, IFS had already introduced a range of products with no adverse effect on the earth's ozone layer. At the time, the Daily Telegraph reported this as "a breakthrough ...in the invention of an insulation foam which does not use so-called CFCs." The industry at large took more than six years to catch up.

In more recent times, IFS again led the way by supplying foam systems in which the blowing agents have particularly low values on the Global Warming scale. Many grades sold by IFS meet the 'less than 5' value required by the Building Research Establishment.

Polyol Development

Polyurethanes are manufactured from chemicals called polyols. These materials are conventionally manufactured from petrochemicals derived from mineral oils. The latest and significant development from IFS is a range of polyols derived from renewable materials such as rapeseed oil and other vegetable oils. The idea is not new, the development was announced at Utech Asia '95 when IFS Managing Director, Barrie Colvin, gave a paper entitled "Low Cost Polyols from Natural Oils". At that time only small quantities of these materials could be used in rigid foam applications. The situation was similar to the more recent development of bio-diesel which is added at low levels to conventional diesel. It was nevertheless an important move in the right direction. As time went on, and the importance of using renewable base materials became evident, the process was continually refined. Today we have a fully proven product which has excellent properties and has been fully tested in many industrial applications.

From an environmental point of view, what could be more desirable than growing chemicals in the fields of Britain, using minimal energy to convert these crops to natural oil polyols and then converting them to high performance polymeric materials?

The NOP Process

The conversion of natural oils (glyceryl esters of fatty acids) to useful polyols is a fast, inexpensive process performed as a batch process utilising very low levels of energy. The original process, developed in the 1980s, had limited application but was successfully transferred to several countries with significant supplies of indigenous oils. We provided a Design 1 plant to Malaysia many years ago and it has continued to produce excellent quality products for the refrigeration industry ever since. A plant was also sold to Brazil where soya-bean oil is converted to polyols for the polyurethane industry.

The new NOP process has been designed to extend the range of uses for polyols derived from rape-seed oil. Typical polyol properties are shown below:

Hydroxyl Value	mg KOH/g	425
Viscosity	mPa s	3100
Specific Gravity	g/ml	1.08
Acid Value	mg KOH/g	0.3
Water Content	%	0.2

Enviropol 2543 Base polyol for rigid foams

The polyol described above is derived from 100% natural, vegetable origin and can be used as the sole polyol ingredient in rigid foam applications. It is produced on a regular basis for incorporation into fully formulated foam systems for the insulation and refrigeration industries.

NOP Properties

For the manufacturer of polyurethane items, the processing properties of NOP-based materials are essentially the same as conventional materials. The latest products exhibit:

- * Excellent foam flowability
- * Improved demould time
- * Low viscosity
- * Excellent compatibility with low GWP blowing agents

Natural Oil Polyols



Malaysian NOP Plant



Construction of Brazilian Plant

...taking environmental technology to the next level...



Commercial refrigerator with insulation based on rape-seed oil



The very first commercial application of Envirofoam polyol. An 11km pipeline was insulated using polyol derived from sunflower oil. The above-ground pipeline is in Tuticorin, Southern India. Using local labour with a Probler T3A dispensing machine, two metre sections of pipe were insulated in succession. The pipe has continued to carry naptha and liquid ammonia from the jetty to a chemical complex in the city. The measured U-value of the insulation was 0.4 W/m²K for a 50mm thickness.

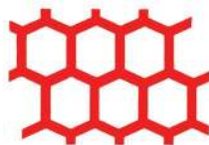


Composite panels with various substrates have been manufactured with vegetable-based polyols. Adhesion to substrates is excellent and no changes to normal production processes are required. The thermal conductivity of these building panels was measured at 0.021 W/mK. The buildings have performed very well for nearly 15 years, the insulation being indistinguishable from conventional polyurethane foam.



A wide range of refrigerated cabinets has been manufactured using rapeseed oil-derived polyols. Enviropol 2543 was used at 100% inclusion level to provide a robust, thermally efficient material with a thermal conductivity of less than 0.023 W/mK. With a closed-cell content on >90%, the new Envirofoam range of chemicals provide long-term insulation performance which is unrivalled in environmental characteristics.

The environment matters let's all do our bit!



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