White Biotechnology Backgrounder

What is White Biotechnology?

White biotechnology, or industrial biotechnology as it is also known, refers to the use of living cells and/or their enzymes to create industrial products that are more easily degradable, require less energy, create less waste during production and sometimes perform better than products created using traditional chemical processes.

Not to be confused with red biotech (health-related applications of biological technology), blue (marine) biotech or green (agricultural) biotech,
white biotechnology is widely regarded as representing the next evolutionary step towards a sustainable and environmentally-friendly chemical manufacturing industry, which itself creates the building blocks that comprise every man-made object and applications range from biofuels to pharmaceuticals, food nutrients, chemicals and other materials.

White biotechnology is not new. Indeed, biotechnology has been used in industrial applications for the creation of food nutrient, washing powders and other products for many years. However recent scientific advances in the fields of genomics, molecular genetics, metabolic engineering and catalysis, coupled with advances in enzyme and fermentation technology as well as external factors such as soaring energy prices, renewed environmental concerns and energy security fears, have combined to make white biotechnology more important than ever.

Human knowledge of white biotech has evolved to the point where today, products derived from white biotechnology often display better performance, higher sustainability and more commercially-viable characteristics to products created from traditional chemical procedures.

White Biotechnology today

White biotechnology works by marshalling living cells into micro-factories that, by using biomass as a feedstock rather than traditional petrochemicals, create a variety of materials with energy efficiency, increased productivity and better safety and environmental characteristics than could have been otherwise achieved by traditional means.

White biotechnology is already delivering measurable results in reducing industry's reliance on non-renewable raw materials, and also in reducing its carbon footprint. DSM, for example, is set to produce succinic acid – a platform chemical used in numerous applications – using white biotechnology for the first time in 2009. By using a fermentation process that relies on micro-organisms, the result is a 40% reduction in energy requirements and an actual positive impact on CO2 levels, as carbon dioxide is actually used in the production process.

DSM will open a demonstration plant for bio-succinic acid in France 2009, in collaboration with the French company Roquette. This plant is expected to begin producing succinic acid at an industrial level within two years.

DSM also applies white biotechnology at one of its antibiotics plants in the Netherlands, with the result that the firm has been able, through advanced fermentation technology, to replace

a complex 13-step chemical process with a one-step fermentation, two-step enzyme process, leading to energy savings of 65% and a halving of raw material costs.

Today, DSM is the global leader in white biotechnology outside bio-ethanol, with a fermentation network comprising 14 plants worldwide with a total fermentation capacity of appr. 30 million cubic metres per year.

Second Generation: The Future of White Biotechnology

White biotechnology is already delivering considerable savings, both financially and environmentally, by reducing or eliminating our reliance on scarce resources and reducing greenhouse gas emissions from production.
However, application of white biotechnology on an industrial scale is limited by the fact that it, too, relies on scarce resources: sugar and starch. With reliance traded from one set of commodities to another, the resulting scenario is one where unsustainable demand from industry for sugar and starch would have catastrophic knock-on effects on food and other crop prices.

Today, as an outcome of wide ranging research by industry, governments and research institutes, progress is beginning to be made in the formulation of 2nd generation technology which enables the recovery of sugar from biowaste rather than food crops or the production of high yield crops such as elephant grass from non-agricultural land. This technology goes a long way to ensuring that demand for biofuel will be able to be met – with the correct regulatory and governmental assistance – without any meaningful impact being made on food prices or food production.

DSM is working with a number of international partners including the US Department of Energy to overcome the challenges posed by white biotechnology and is well positioned to play a leading role in the development of 2nd generation technology to meet the perceived demand for biofuels and other applications.

The company has already invested hundred of millions of euros in this area and has placed its ambition to be at the forefront of a technology which it believes will transform the nature of manufacturing industry and society at large, at the very heart of its business.

DSM – the Life Sciences and Materials Sciences Company

Royal DSM N.V. creates innovative products and services in Life Sciences and Materials Sciences that contribute to the quality of life. DSM's products and services are used globally in a wide range of markets and applications, supporting a healthier, more sustainable and more enjoyable way of life. End markets include human and animal nutrition and health, personal care, pharmaceuticals, automotive, coatings and paint, electrical and electronics, life protection and housing. DSM has annual net sales of EUR 9.3 billion and employs some 23,500 people worldwide. The company is headquartered in the Netherlands, with locations on five continents. DSM is listed on Euronext Amsterdam.