

Nestlé Chile began running production trials with enzymatic interesterification in August 2004 following a directive from headquarters to change to trans-free fats.



## Nestlé Chile aims to produce trans-free fats

Today, the Maipú plant of Nestlé Chile is facing a challenge because of a worldwide Nestlé directive to eliminate the trans fats in the fats used in the company's production processes. Trans fats are suspected of causing health problems and could become the focus of consumer concern in the future. In the USA, for example, new food labelling requirements will be introduced to address this issue. The FDA (Food and Drug Administration) has stipulated that all food labels in the United States must declare the trans fats content by the beginning of 2006. This has stimulated great interest in alternative production methods for oils and fats, in particular enzymatic interesterification.

The Maipú fats production plant is the first to test the enzymatic interesterification process in Chile, and the third in Latin America. At the Maipú factory in Chile, Nestlé has been running trials in the production of fats without trans fatty acids (trans fats).

They have tested the enzymatic interesterification process using Novozymes' enzyme Lipozyme® TL IM (see graphs). This process changes the melting profiles of edible oils and fats without increasing the content of trans fatty acids. In contrast, the traditional partial hydrogenation process that the plant is currently using results in the formation of these substances.

### A unique Nestlé plant

The Maipú fats production plant has been operating since 1978 and is the only oils and fats factory in the Nestlé group worldwide. It has a production capacity of 15,000 tons per year divided equally between margarine and shortenings. (While margarines and spreads are water-in-oil emulsions, shortening is just the fat without water.)

The main customers are the McKay Biscuits Factory, part of Nestlé, located on

the same site, and another Nestlé factory in San Fernando that produces 'culinary' foods. They account for 45% of the production output, and the remainder is sold to other factories or to consumers, mainly in the form of table margarines.

The deadlines given by Nestlé for the change to a fat with low trans fats on the Chilean market are early 2005 for biscuit production and mid-2005 for culinary food production.

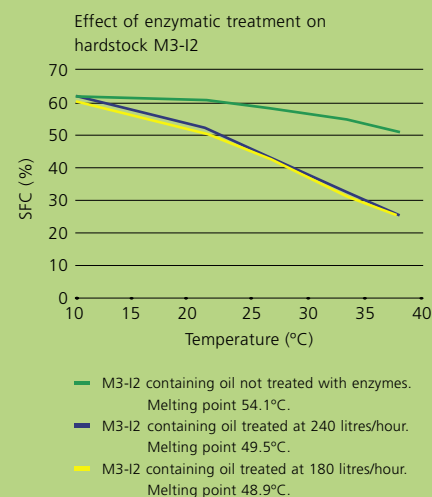
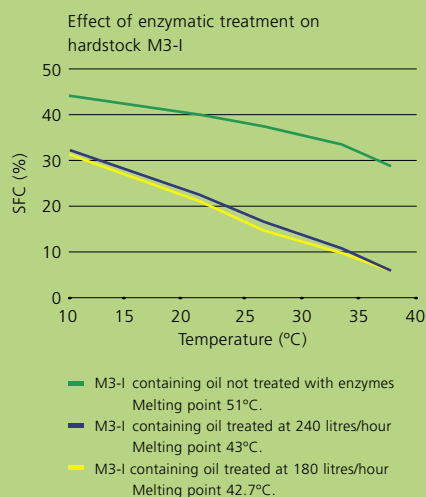
### Enzyme trials

There are three basic ways to modify edible fats: hydrogenation, interesterification (chemical or enzymatic) and fractionation.

Fractionation is commonly used with tropical oils such as coconut and palm.

The hydrogenation process is the most commonly used method in North and Latin America, but it is under discussion because

From left: Miguel Opazo, production chief at Nestlé in Maipú; Luis Alessandro from Novozymes, the technical coordinator for Oils & Fats in Latin America; and Daniel Rodríguez, production supervisor at Nestlé in Maipú. In the background, the 100-kg Plug & Play reactor built by De Smet and installed in August 2004 for trial purposes.



The solid fat content (SFC) was measured by nuclear magnetic resonance (NMR) at different temperatures. M3-I and M3-I2 are Nestlé code names for two different hardstocks used in the trials. Some trials were conducted with hardstock containing oil treated by enzymatic interesterification using Lipozyme® TL IM, and this changed the melting properties compared to the original untreated hardstock. The flow rate indicates how fast the oil passed through the De Smet enzyme reactor.

it produces trans fats. Nestlé Chile has been running trials with enzymatic interesterification since October 2003. The initial trials were on a laboratory scale.

In order to develop the project and validate the results, Nestlé Chile hired the services of the Department of Food Engineering at the University of Chile. The Maipú fats production plant also has its own laboratory team consisting of three people who worked on the project.

Miguel Opazo is the production chief for the fats production plant with 53 employees. He explains: "We started by looking into the theory of enzymatic interesterification. Afterwards we got in touch with Novozymes and lab trials were arranged. Then, in August 2004, we started industrial trials on a pilot scale with a De Smet Plug & Play reactor that we borrowed from

Novozymes for about three months. The aim of the trials was to obtain the same types of fat as we are currently producing by partial hydrogenation. We wanted the same physical, chemical and organoleptic properties as before, including the same melting profiles. We were able to achieve this with enzymes. We maintained the same quality without increasing costs or reducing yields. At the moment, we are waiting for the validation and application of the newly-produced fats by the Nestlé factories on the Chilean market."

#### Advantages

Miguel Opazo believes that the hydrogenation process is a more effective way of making tailor-made fats to meet specific customer requirements. It is easy to control the degree of hydrogenation and the

functionality of the fat. However, he sees advantages in enzymatic interesterification apart from the obvious one of producing fats free of trans fats: "We can avoid using as much hydrogenated vegetable oil in our process," he says. "In the case of enzymatic interesterification, natural sunflower oil can be blended in equal amounts with fully hydrogenated sunflower oil. This helps the factory to reduce production costs. Enzymatic interesterification is a new process for us and we do not yet know all the possibilities."

Enzymatic interesterification is performed in fixed-bed enzyme reactors filled with the immobilised enzyme Lipozyme TL IM. Following the successful production trials in 2004, Nestlé is considering whether to invest in four 100-kg enzyme reactors at the Maipú factory. ●



Iván Guerrero (left) from the University of Chile has carried out trials to find suitable base stocks. Mauricio Rocco, who is responsible for Quality Assurance at Nestlé Chile, has investigated enzymatic interesterification in the lab using the glass reactor shown here.

FOR MORE INFORMATION  
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