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# Butalco Newsletter

## No. 1 / March 26, 2013

Butalco assesses and develops new production processes for second generation biofuels and biochemicals with competitive production costs and high efficiency. Our core technology is to genetically optimise yeasts to enable increased yields in bioethanol, biobutanol and other biochemical production. We solely focus on this bottleneck technology and have licensing as our main business model.

This newsletter, which is to be published around every 4 to 6 months, shows activities within the company and actual developments in related scientific research. If you require further information, please visit www.butalco.com or contact Gunter Festel (gunter.festel@butalco.com).

## Company & business news

### 1. Butalco company portrait in Frankfurt university's report

"UniReport", a magazine published by Goethe University Frankfurt, presented a company profile of Butalco in its December 2012 issue. The report includes Butalco's historical background and recent economic and technical successes. With this presentation, Butalco has once more outlined its dynamic growth and great future potential to a broad audience.

Link: http://www.unireport.info/44376478/unireport_6-12.pdf (see page 7)

### 2. Lesaffre acquires xylose isomerase technology from Butalco

In 2012, the French group Lesaffre acquired the xylose isomerase (XI) technology from Butalco. This sale of the xylose isomerase technology was an important milestone for Butalco and its future business development, as it ensures the investment of additional resources in our other internal R&D programmes, like butanol producing yeasts or xylose transporters. However, in this transaction Butalco has been granted a non-exclusive license to use this XI technology for the production of butanol, with the right to sublicense to a third party.

Link: http://www.lesaffre.com/upload/docs/120817-lesaffrexitechno-1346148262.pdf

### 3. Updated website and company profile

At the beginning of 2013, Butalco's website was updated and a new company profile presentation, including its technologies, market potentials and strategy, was prepared and made available on the website.

Links: www.butalco.com
http://www.butalco.com/Company_Profile.pdf

### 4. EU Commission to cap food-based biofuels in major shift

In October 2012, the European Commission published a proposal to limit global land conversion for biofuel production, and raise the climate benefits of biofuels used in the EU. The use of food-based biofuels to meet the 10% renewable energy target of the Renewable Energy Directive will be limited to 5%. This is to stimulate the development of alternative, second generation biofuels from non-food feedstock, like waste or straw, which emit substantially less greenhouse gases than fossil fuels and do not directly interfere with global food production. This announcement perfectly matches Butalco's business focus on the development of second generation biofuel technologies and opens up excellent market potentials.

Links: http://europa.eu/rapid/press-release_IP-12-1112_en.htm

## Recent developments in scientific research

### 1. Construction of the first yeast strain producing muconic acid

Muconic acid serves as an interesting precursor and platform chemical for producing several bioplastics. It can be easily hydrogenated to yield adipic acid, a precursor used for the production of nylon-6,6 and polyurethanes. Alternatively, it can be converted into terephthalic acid used to produce polyethylene terephthalate (PET) or polyesters. World production of adipic acid and terephthalic acid is over 2.8 and 71 million tonnes, respectively.

Link: http://aem.asm.org/content/78/23/8421.abstract

### 2. Yeast strains with improved production of isobutanol

The branched chain alcohol isobutanol exhibits superior physicochemical properties as an alternative biofuel. The yeast saccharomyces cerevisiae naturally produces low amounts of isobutanol as a by-product during fermentations, resulting from the catabolism of the amino acid valine. A cytosolic isobutanol production pathway was successfully established in yeast by re-localisation and optimisation of mitochondrial valine synthesis enzymes together with overexpression of Aro10 decarboxylase and Adh2 alcohol dehydrogenase. The resulting yeast strain produced the highest titers of isobutanol ever reported to be produced by a yeast.

Link: http://www.biotechnologyforbiofuels.com/content/pdf/1754-6834-5-65.pdf

### 3. First yeast strain fermenting xylose into isobutanol

Xylose is a waste sugar which normally cannot be utilised by yeasts cells. A yeast strain has been constructed which cannot only utilise xylose but can even transform it into the valuable alcohol isobutanol. The branched chain alcohol isobutanol exhibits superior physicochemical properties as an alternative biofuel. This approach should allow the conversion of plant waste streams into a valuable biofuel.

Link: http://www.ncbi.nlm.nih.gov/pubmed/23279585