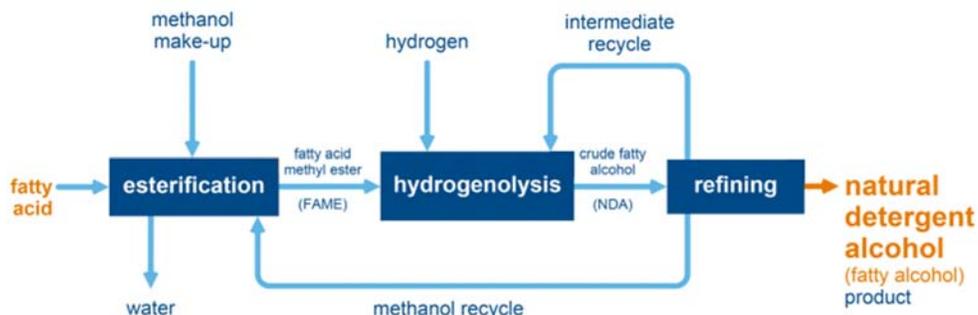


Process description:

Natural Detergent Alcohols (NDA)

Johnson Matthey have licensed the greatest number of plants worldwide for the production of natural detergent alcohols (NDA), also known as fatty alcohols.

Our process is designed with an esterification step prior to hydrogenolysis. This achieves greater efficiency, ease of operation and product quality as well as allowing use of lower-cost materials of construction for the hydrogenolysis and refining sections.



Fatty alcohols are produced in two stages: esterification of a fatty acid feed to form methyl esters, followed by vapour-phase hydrogenolysis to convert the methyl ester intermediate to a crude NDA product mix of various chain lengths.

The purpose of the esterification step is to produce a non-acidic intermediate – the methyl ester – which allows lower-cost carbon steel material selection in hydrogenolysis.

In addition, our esterification reaction system removes the reaction water produced prior to hydrogenolysis, which enhances process efficiency.

Process feedstock

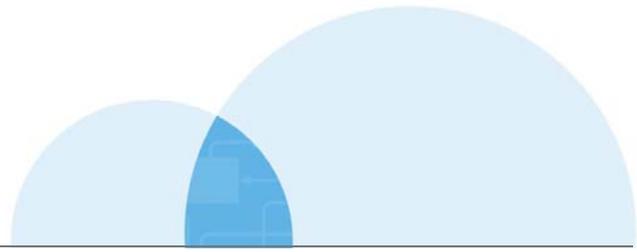
The **DAVY™** NDA process can convert short chain (C8/C10), medium chain (C12/C14) or long chain (C16/C18) fatty acids to their equivalent alcohols. The process feedstock comprises fatty acids predominantly derived from palm kernel or coconut oils that have been distilled and fractionated into these different cuts.

Plants are normally optimized for C12/C14 processing to meet predominant market demand, but different cuts can be processed on a campaign or continuous basis. This **DAVY** process is also tolerant of loose cuts, for example the C12/C14 feed may typically contain up to 10% C16.

Esterification

The pre-heated liquid fatty acid feeds to the top of the esterification reaction column, in which it reacts with methanol to form its equivalent fatty acid methyl ester (FAME):





The reaction proceeds in the presence of a proprietary solid catalyst, achieving almost complete conversion to the methyl ester intermediate.

Water produced in the esterification reaction is stripped from the methyl ester by excess methanol vapour and taken overhead of the reaction column.

The methyl ester then feeds directly to hydrogenolysis without any further process steps.

Hydrogenolysis

Ester hydrogenolysis proceeds in the vapour phase at low pressure, over a fixed bed of chrome-free copper catalyst, producing a crude fatty alcohol product stream and methanol:



This methanol produced by the hydrogenolysis reaction is recycled back to the esterification stage to minimize the requirement for methanol make-up.

Refining

Crude fatty alcohol is refined to produce high-quality product in a single distillation column. Subsequent polishing converts any residual carbonyls (principally aldehydes) in the product to alcohols. Other intermediates and by-products are recycled for re-use in the process or used as fuel.

Process option: different feeds

The **DAVY** NDA process can also operate with non-acidic methyl esters fed directly to the hydrogenolysis stage, bypassing the esterification step.

This offers our licensees the option of using alternative feedstocks, depending on availability.

Process option: different fatty acid cuts

The **DAVY** NDA process is normally optimized for C12/C14 production, but it is possible to switch to C8/C10 or C16/18 production on a continuous or campaign basis, as required.

Process option: hydrogen generation

An alternative production route for the hydrogen required for hydrogenolysis is to use the methanol/water stream from esterification to feed a methanol reformer package.

The offgas can be used as fuel within the package. This reduces the size of the methanol recovery column and eliminates the waste water stream.



The Johnson Matthey advantage

Johnson Matthey's use of esterification prior to hydrogenolysis has transformed fatty alcohol production.

The benefits of this innovation are numerous, from reduced capital costs to milder, safer operating conditions and improved conversion.

Process flexibility	<ul style="list-style-type: none">• Our NDA process converts short chain (C8/C10), medium chain (C12/C14) and long chain (C16/C18) fatty acid feedstocks to their equivalent alcohols.• Additionally, our process can operate without the esterification step, instead taking a methyl ester feed directly to hydrogenolysis. We can therefore produce fatty alcohols from an acid or ester feed, or a combination of acid and ester feed, in the same plant.
Simplified catalysis, process efficiency	<ul style="list-style-type: none">• The esterification and hydrogenolysis catalysts remain in their respective reaction vessels, eliminating the need for catalyst separation and neutralization at any stage of the process.• The esterification catalyst can also be changed at 100% load without any downtime or loss of production.
Low material and equipment costs	<ul style="list-style-type: none">• The esterification step neutralizes the acidic feed. This enables the hydrogenolysis and refining systems to be made of inexpensive carbon steel.
Low-cost, higher-performance catalyst	<ul style="list-style-type: none">• The non-acidic hydrogenolysis environment also allows use of a base-metal catalyst instead of a high-grade precious metal catalyst. This delivers superior performance at lower cost.
Net savings over conventional processes	<ul style="list-style-type: none">• The combined savings of cheaper construction materials and catalysts more than compensate for the cost of the added esterification step.

The information contained within this document was previously published on a former **DAVY™** website.

Information contained in this publication or as otherwise supplied to Users is believed to be accurate and correct at time of going to press, and is given in good faith, but it is for the User to satisfy itself of the suitability of the Product for its own particular purpose. Johnson Matthey plc (JM) gives no warranty as the fitness of the Product for any particular purpose and any implied warranty or condition (statutory or otherwise) is excluded except to the extent that exclusion is prevented by law. JM accepts no liability for loss or damage (other than that arising from death or personal injury caused by JM's negligence or by a defective Product, if proved), resulting from reliance on this information. Freedom under Patent, Copyright and Designs cannot be assumed.

Johnson Matthey Davy Technologies Limited, Registered Office 5th Floor 25 Farringdon Street London EC4A 4AB Registered in England No. 635311

Offices worldwide. For contact details please visit our website.

DAVY is a trademark of the Johnson Matthey group of companies.



Johnson Matthey
Process Technologies

www.jmprotech.com

1594JM/0317/0/PT/web
© 2017 Johnson Matthey Group