The challenge is to find a catalyst which works at modest temperatures and pressures, does not need huge reactors or complex methods to retain it and is not too expensive to install

Is this the answer?

In a process known as catalysis, a relatively small amount of foreign material, or catalyst, participates in the chemical reaction but is not consumed by the reaction itself. A catalyst can make a reaction go faster and in a more selective manner. Because of its ability to speed up some reactions and not others, a catalyst enables a chemical process to work more efficiently and often with less waste.

One molecule of catalyst can make a million molecules of product.

Biodiesel is most commonly manufactured today using sodium/potassium hydroxide or their corresponding methylate. These materials do not conform to the strictest definition of a catalyst. They react with process ingredients, changing the relatively simple process of transesterification into a complicated capital intensive process. Caustic compounds deliver a number of unwanted by-products as well as a co-product glycerol that requires extensive further processing to achieve commercial quality standards.

While caustic materials are efficient convertors of triglycerides into FAMEs, commercially unavoidable contaminants such as water and free fatty acids (FFAs) lead to soap production either by direct neutralisation of the fatty acid or by saponification of water contamination.

FFAs lead to a 10% increase in its weight as soap, but water has the potential to produce fifteen times. This yield impairment is partially recovered by processors by on processing to fertilisers and recovery of FFAs. However for the majority of processors the soap leads to glycerol of low purity and little commercial value.

Caustic-based compounds used for biodiesel production are highly polar molecules and are efficient up to the point where the reaction begins to produce glycerol. At this stage both the caustic and the methanol are progressively entrapped in the glycerol phase significantly reducing the systems ability to complete the reaction in a timely manner. A number of process variations have been adopted by processors to accommodate this phenomenon. Most common are the use of excess methanol, and the removal of the glycerol followed by a caustic/methanol recharge. Both have merit and produce the desired result.

A catalyst in its true definition would eliminate all of these problems.

Research has focused on heterogeneous catalysts as the solution to the problematic caustic process. Such catalysts would deliver only two products – biodiesel and glycerol of marketable quality and optimum yield.

A heterogeneous catalyst would eliminate a number of unwanted and variable processing stages, reducing capital costs and increasing throughput. A heterogeneous catalyst system would deliver truly continuous biodiesel processing.

French technology provider Axens has developed and commissioned a heterogeneous catalyst technology, but it is only suitable for plant capacities in excess of 100,000 tonnes a year. The process operates at high temperatures and pressures and requires a high level of operational skill.

Heterogeneous catalyst that performs at low temperatures and atmospheric pressure is what the biodiesel industry requires. This would allow the majority of biodiesel processors to increase their capacity and their profitability with the elimination of unwanted by-products.

In response to this Ceimici Novel, an Ireland-based technology company, is introducing Smart Catalyst.

The catalyst SCRO-80 delivers the maximum yield achievable and two singular reaction products of the highest purity.

Heterogeneous catalysts that do not react with process ingredients and that are insoluble in the reaction medium ensure that maximum conversion is attained. The need to use large excesses of methanol is negated and the ability of such catalysts to operate at low temperatures ensures that the reaction equilibrium is sufficient to ensure that EN 14214 specification is easily attained.

Heterogeneous catalysts such as SCRO-80 deliver a reaction mixture consisting solely of FAME, glycerol, methanol and insoluble catalyst. The desired products FAME and glycerol are separated using current standard separation procedures. The catalyst, being insoluble, is readily separated by filtration and is available for reuse.

It is also unaffected by process ingredients and its reusability, as determined by turnover rate, has been evaluated as >100.

Such catalysts will provide the processor with increased biodiesel yields as well as glycerol of higher value, increasing profitability and reducing the number of process work-up stages to a minimum. Water or waterless washing stages are eliminated and the current processing capacity will increase by a factor of five.

The elimination of these processing stages will significantly reduce utily and labour costs.

New entrants to the market will enjoy capital cost reductions up to 80% with plant entry level capacities reduced to 10 million litres/year.

Such plants are insensitive to location and are viably sited on the farm or in the plantation. ●

Heterogeneous catalyst SCRO-80

Material handling	Non toxic Non corrosive
Catalyst compatibility	Does not react with FFAs Complete transesterification in the presence of 2% water No soap produced
Catalyst reactivity Intensive mixing mode	Transesterification rates range from 10 seconds to 90 seconds Temperatures ranging 60°C-10°C
Product purity	Biodiesel 99%+ Glycerol 98%+
Catalyst	SCRO-80 Recoverable and reusable, turnover rate >100

For more information:
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