

# Low energy consuming novel impeller for stirred tank reactors

## EXECUTIVE SUMMARY

A novel impeller that completely covers the stirred tank reactor causing uniform mixing with less power consumption

## BACKGROUND

Stirred Tank Reactors (STRs) use mechanical stirrers with impellers to mix and distribute heat/materials – and are used in the chemical, pharmaceutical and fermentation industries. The efficiency of the STRs entirely depends on the design and location of the impellers in the tank. It is difficult to achieve uniform spatial distribution of energy in the STRs due to inability of the conventional impellers to reach the bottom of the tank and not achieve uniform temperature while operating at a low speed to avoid high shear zones in the fluid.

## TECHNOLOGY DESCRIPTION

The impeller developed by NCL scientists is designed to cover the STR, offer low shear and provide uniform mixing, with relatively less energy consumption. This unique design also helps generate necessary flow even in the regions close to the tank floor. The impeller design achieves all this; yet occupies very little volume.

## MARKET POTENTIAL

- The worldwide market for chemical mixers is estimated to be between USD 1-1.5 billion\* in 2010 – which presents a good potential for impellers to be adapted in the chemical mixer market

\* Data for year 2000 was obtained from this source:  
[http://www.pcmag.com/Articles/Web\\_Exclusives/BNP\\_GUID\\_9-5-2006\\_A\\_1000000000001097398](http://www.pcmag.com/Articles/Web_Exclusives/BNP_GUID_9-5-2006_A_1000000000001097398); A growth rate of 5% was assumed for the time period 2000-2010 to arrive at this market size

## VALUE/ADVANTAGES

- Aids in reducing non-uniformities/ develop a uniform randomness throughout the tank
- Power number of our impeller is relatively low (more efficient) as compared to other standard impellers due to the uniform structure that helps maintain similarity in the flow, making energy distribution uniform
- Wake formation is almost zero behind the blades, reducing the drag and hence the power consumption
- Results in low shear rate, necessary for the shear sensitive media

## APPLICATIONS

STRs are used in various areas of chemistry, pharma and fermentation at different scales of operation, mainly for:

- Mixing/blending two miscible liquids (of different viscosities), generating dispersions for gas-liquid and liquid-liquid reactions
- Keeping the solid particles in contact with the liquid to increase the solid-fluid interactions to achieve solid dissolution
- Crystallization

## TECHNOLOGY STATUS

- Demonstrated at the lab scale
- On the lookout for potential partners for spin-off / licensing
- Patent application filed- US & IN

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