



Glass-lined Reactor Geometry Cuts Pharmaceutical Mixing Time by One-Third

VERTOLAYE, FRANCE - The Corticosteroids Department of Aventis has started up two new, glass-lined agitated reactors that are expected to produce significantly more of the company's products than possible using the conventional reactors previously employed. The two new reactors, each of 1650-gallon (6,300-liter) capacity, replaced conventional glass-lined units.

The new glass-lined steel reactors employ three glass-lined baffles that attach to the reactor wall, rather than the single baffle used in conventional glass-lined equipment. As a result, mixing times are reduced by approximately one-third (Fig.1) through improvements in heat and mass transfer, solids suspension and distribution, gas dispersion and gas flow rates. In addition, the design reportedly makes for easier cleaning between batch operations.

Trademarked OptiMix, the reactor design is patented and manufactured by De Dietrich Process Systems (DDPS; Mountainside, NJ and Zinswiller, France).

The baffles are formed as an integral part of the reactor wall, explains Jean-Marie Eslinger, marketing manager for De Dietrich. "This is a radical change from the standard design, in which a single baffle is suspended in the reactor from a nozzle located atop the unit. The latter arrangement precludes the use of multiple baffles in most cases because each additional baffle would occupy a nozzle required for sampling, cleaning, introducing reactants, monitoring or other processing requirements. Consequently, only larger reactors generally have more than one flange-mounted baffle."

"In addition to freeing an upper flange for other uses, wall mounted baffles eliminate dead zones that are difficult to access and clean. It also reduces vortexing significantly and, in turn, the amount of product that dries and sticks to the heated wall above the liquid level," says Eslinger.

Aventis has confirmed these performance improvements in tests - first with a 100-gallon (400-liter) pilot reactor, then with a 650-gallon (2,500-liter) multipurpose production unit that started up in 2004. Using the latter reactor, Aventis compiled performance data for six products, says M. Mickael Maunoir, technical manager for the company's PMT Corticosteroids Department. Mixing times for those products have been reduced compared with results obtained using a conventional reactor, he says.



Three baffles are used in OptiMix reactors to match the number of agitation blades, canceling radial stresses that would otherwise be incurred by the hub.



Three sidewall-mounted sets of baffles reduce vortexing and splashing of the reactor head, and minimize the amount of product that dries and sticks to reactor wall, while reducing mixing time by one-third.

“Along with the improvements in mixing efficiency, the reactor has achieved a significant reduction of the vortex,” says Mau-noir, adding, “We have also noticed the total disappearance of any splashing on the top of the reactor, which dramatically improves its ease of cleaning and cleaning validation.”

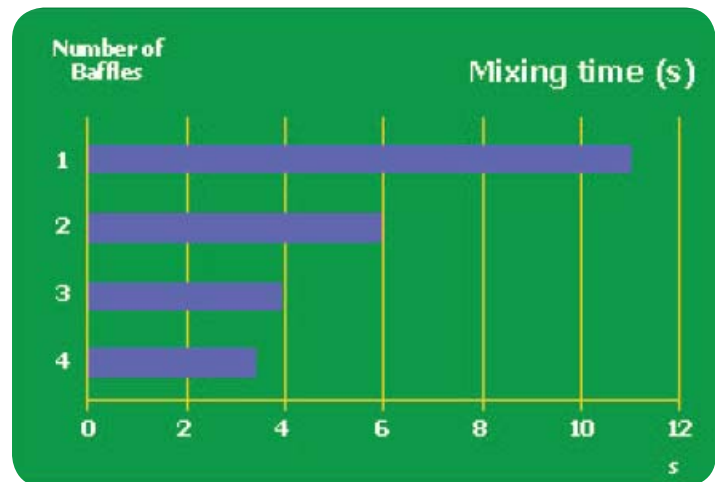
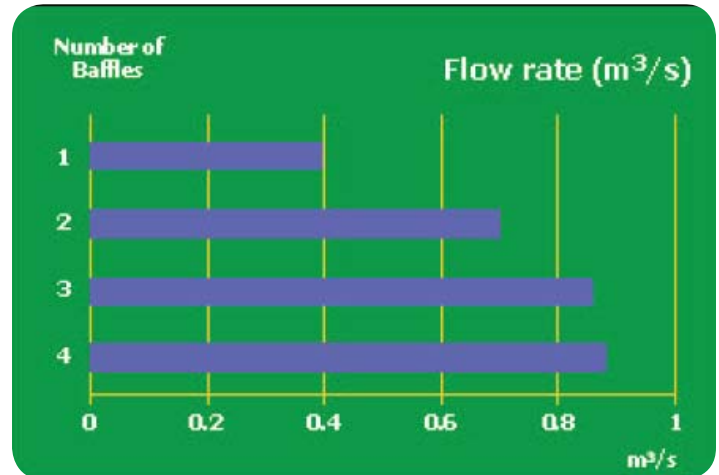
Three baffles are used in the OptiMix reactors to match the number of agitation blades. This helps prevent the occurrence of undesired vibrations, says Eslinger. Each blade passes each of the three baffles simultaneously, thereby canceling radial stresses that would otherwise be incurred by the hub.

The OptiMix reactors are available from De Dietrich with either a standard jacket or HemiCoil (half-pipe) jacket, in sizes from 20 to 10,000 gallons (75 to 38,000 liters) with larger sizes available on a custom basis.

De Dietrich also offers a retrofit service in which the new baffles may be installed in existing reactors for about half the cost of a new unit. After the old glass lining is removed by shot blasting, the baffles are welded to the wall and the new glass lining is applied. Since the configuration of OptiMix reactors is similar to that of the company’s traditional models, upgrades can be made with no modification to piping or connections.

Aventis is part of the Sanofi-Aventis Group, the world’s third largest pharmaceutical concern. The company’s therapeutic areas include cardiovascular disease, thrombosis, oncology, diabetes, central nervous system, internal medicine and vaccines.

De Dietrich Process Systems is an international provider of glass-lined vessels, instrumentation and accessories; filtration, mixing and drying equipment; and turnkey borosilicate glass process plants and associated equipment.



The above charts demonstrate the effect of 1, 2, 3 and 4 baffles on flow rates and mixing times, with 4 baffles yielding a negligible improvement over 3-baffle configurations.