PROCESS INTENSIFICATION

FOR OPTIMAL PERFORMANCE

De Dietrich
PROCESS SYSTEMS

OUR EXPERTISE FOR THE INTENSIFICATION OF YOUR PROCESS

DE DIETRICH PROCESS SYSTEMS RELIES ON A SYNERGY OF ITS COMPETENCIES AND EXPERTISE TO PROVIDE A COMPREHENSIVE OFFER AIMED AT THE FINE CHEMICAL, PHARMACEUTICAL AND RELATED INDUSTRIES. ITS DEVELOPMENT IS ORGANIZED AROUND THREE BUSINESSES: EQUIPMENT, INTEGRATED SYSTEMS AND SERVICES.

SINCE 1684

SINCE ITS CREATION IN 1684, THE FRENCH COMPANY, DE DIETRICH® HAS NEVER STOPPED EVOLVING. BY CREATING SYNERGIES WITH PARTNER COMPANIES, BY INTEGRATING KNOWLEDGE IN SKILL SETS, DE DIETRICH® IS TODAY A WORLD LEADER IN THE DESIGN AND MANUFACTURE OF EQUIPMENT AND ACCESSORIES IN ENAMELLED STEEL FOR THE CHEMICAL AND PHARMACEUTICAL INDUSTRIES.

A COMPREHENSIVE APPROACH

Whether it is a matter of equipment, engineering or services, De Dietrich® develops a comprehensive approach that focuses on operational performance and cost optimization.

SPECIFIC KNOW-HOW

For De Dietrich®, each project is exemplary and each end results in a reference. Our know-how is being applied in the chemical and pharmaceutical sectors and in related industries working in highly corrosive environments.
De Dietrich® can provide you with expertise from initial design up to the time of delivery for integrated systems, including numerical simulation, production of 3D models, manufacture, qualification and training of end users.

ALL THE POWER TO ACT OF AN INDUSTRIAL GROUP

De Dietrich's® promise is first and foremost the expertise developed by its workforce, whether on technical issues or in project management. It is the result of an active research and development policy that facilitates a scientific approach to our special skills. To this expertise, which is backed up by high level equipment, is added irreplaceable practical experience which enables us to check the validity of the choices proposed each and every day. In the end, De Dietrich® is a commitment to responsiveness to create a long and lasting relationship with our customers.

THE EFFICIENCY
OF OPTIMIX® TECHNOLOGY

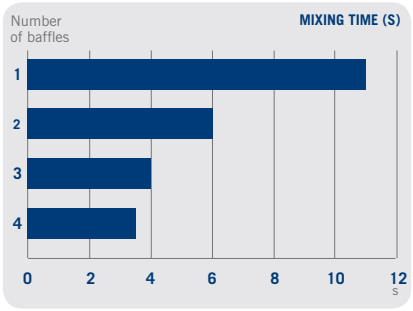
OPTIMIZED MIXING PERFORMANCE

De Dietrich® optimized mixing performance by integrating three baffles into the vessel. This design leads to a notable improvement in the capacity of the mixture and in heat transfer when compared with the standard DIN series. The result is that all the nozzles remain free for the process. This device considerably improves the hydrodynamics by using an optimized baffling effect. Unlike fragile pendular baffles, this design is not affected by vibrations.

LESS WASTE IMPROVED CLEANABILITY

The technology developed by De Dietrich® facilitates tank cleaning. The Optimix® system creates less of a vortex in the tank and therefore less waste. Splatter is reduced. The profile of the paddles prevents the accumulation of crystals in the event of crystallization. This design satisfies two of industry's requirements: optimal process efficiency and improved cleanability of the reactor, as well as reduction in the amount of dead zone which generally occurs with a pendular baffle.

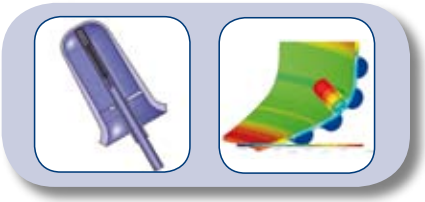
CIRCULATION FLOW X6



CHANGES IN PUMP FLOW AND MIXING TIME DEPENDING ON THE NUMBER OF BAFFLES (CALCULATED FOR A 1600-LITRE OPTIMIX®)

INTERCHANGEABLE EQUIPMENT

The equipment is interchangeable with standard reactors of the same size. These devices come as standard with two coil zones and a GlasLock® agitator, they are also available with a jacket.



TEMPERATURE PROBE IN A LOWER VOLUME

The Optimix® range is fitted with an integrated sensor on the shell which enables control of very small reaction volumes.

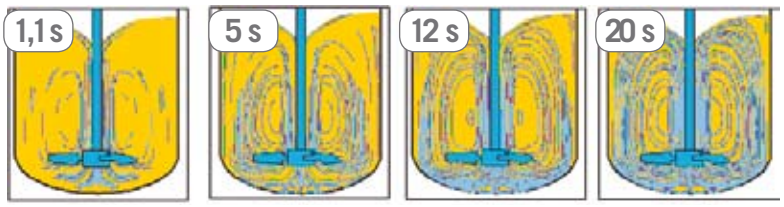
THE MAIN ADVANTAGES

- **Reduced reaction times**
- **Clearance of all the nozzles**
- **Easy cleaning**
- **Integrated temperature measurement**
- **Improved heat transfer**

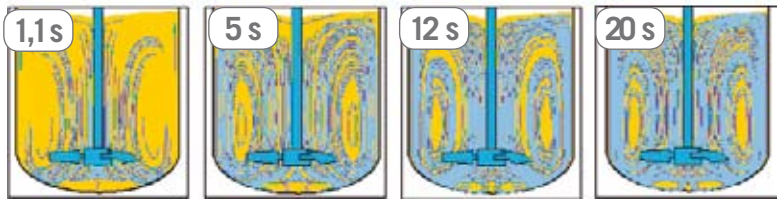
DIN/OPTIMIX® COMPARISON

Primary run-off diagrams

DIN BE REACTOR



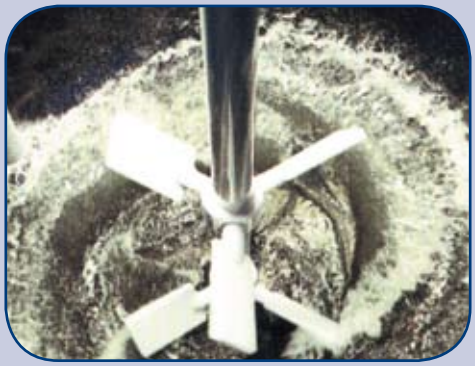
REDUCTION IN MACRO MIXING TIMES - 30%



OPTIMIX®: THREE INTEGRATED BAFFLES

APPLICATIONS SPECIFIC TO OPTIMIX®

DE DIETRICH® DESIGNS AND DEVELOPS CUSTOM SOLUTIONS. OUR EXPERTISE, OUR PROBLEM ANALYSIS AND THE RESOURCES EMPLOYED TRANSLATE INTO APPLICATIONS SPECIFIC TO THE OPTIMIX® REACTOR RESPONDING TO THE NEEDS OF YOUR PROCESSES.



THE WORLD'S ONLY SYSTEM WITH REMOVABLE BLADES

THE GLASLOCK® SYSTEM

TOTALLY ADAPTED TO EACH TYPE OF REACTION

De Dietrich® has invented the GlasLock® system with removable blades. This flexibility favors the versatility of the system and its adaptation to the process. Our teams can define and install a blade profile according to your process and your agitation parameters. This technology makes it possible to fit several flights of blades to better suit the reaction.

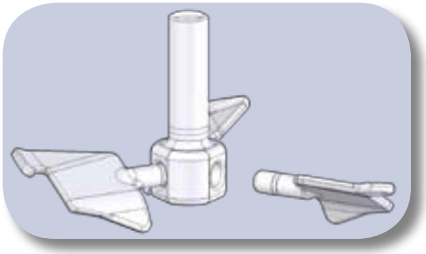
VERY EASY TO ASSEMBLE

The assembly of a blade in its conical emplacement, both fully enamelled, is done using a manual tool according to a simple procedure. The GlasLock® uses a single hub offering greater flexibility by allowing all types of blade profile to be fitted. This technology reduces the time needed to dismantle the drive, when this is required. Fitting and dismantling are carried out laterally, making it possible to work on the scraping agitators without completely dismantling them. With multi-tiered agitators, it is possible to modify just one stage independently of the others by leaving the agitator in place.

MINIMUM AGITATED VOLUME UP TO 1%

The GlasLock® system allows installation of specific blade profiles as well as several flights of blades to better suit the process requirements. This system, therefore, makes it possible to obtain small, non-agitated volumes less than 1%.

A SYSTEM WITH INDIVIDUALLY FITTED AND DISMANTLED BLADES



ENSURED SCALE-UP

In order to ensure scale-up, De Dietrich® has developed identical profiles for the GlasLock® models on welded turbines dedicated to small size, AE type reactors.

THE MAIN ADVANTAGES

- **Multi process-system**
- **Individual dismantling of the blades**
- **Small agitated volume**
- **Easy maintenance**
- **Limited stock of blades**

THE RANGE

SELECTION CRITERIA	MONOBLOCK AGITATORS					
	Impeller	Turbine	Anchor	Frame	Flat blades 30°	Flat blades 45°
REACTOR TYPE	AE-CE	AE-CE	AE	AE-CE	AE-CE-BE	AE-CE-BE
PRIMARY FLOW	←	tilt function	↻	↻	↓	↓
RUN-OFF RATE	●	●	○	○	●	●
PERIPH. SPEED M/S	3 to 8	3 to 12	0,5 to 3	0,5 to 3	3 to 8	3 to 8
MAX. VISCOSITY CP	8.000	3.000	150.000	100.000	3.000	4.000
HOMOGENISATION	+	+	-	+	-	+
SUSPENSION	++	-	-	-	-	+
DISPERSAL	++	++	-	-	-	+
GAS/LIQUID	+	+	-	-	-	-
HEAT EXCHANGE	+	+	++	+	-	+
CRYSTALLIZATION (FRAGILE PARTICLE)	+	-	++	+	+++	++
d/D*	0,55	0,3 to 0,4	0,9	0,3 to 0,41	0,41 to 0,44	0,41 to 0,44

*d : blade diameter
D : internal diameter of the reactor

Flow % radial, % axial, tangential

Run-off ● turbulent ● turbulent/laminar ○ laminar

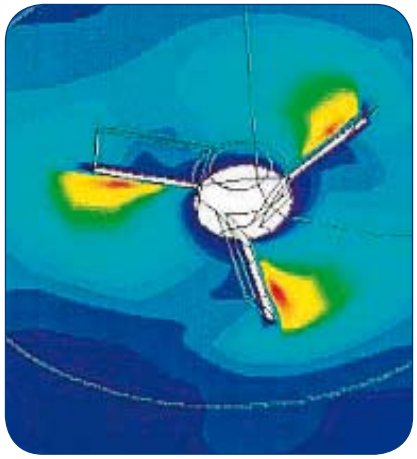
Applications +++ perfectly suitable ++ more than suitable + suitable - not recommended

DEDICATED NUMERICAL TOOLS

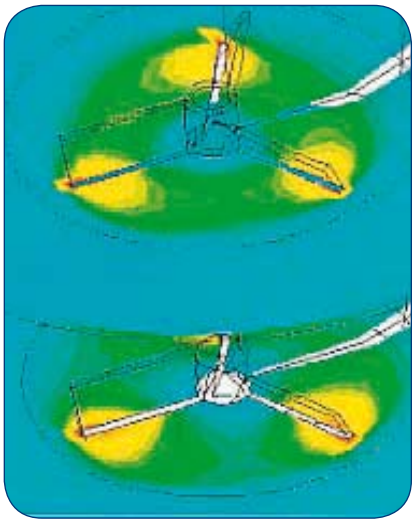
THE CFD « COMPUTATIONAL FLUID DYNAMICS »

COMPLETELY ADAPTABLE TO EACH TYPE OF REACTION

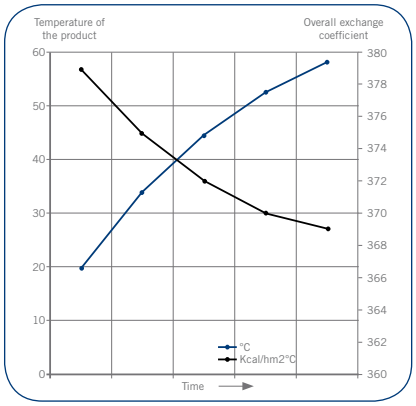
To improve process efficiency, De Dietrich® proposes a new experimental, digital approach. The programmes employed are various: pilot test stations with data acquisition in real time, study of flows generated by an agitator, establishment of the critical emulsion speed. Digital simulation also finds an outlet in various applications: speed profile analysis around moving parts, primary run-off flows, turbulence studies, calculation of thermal data.



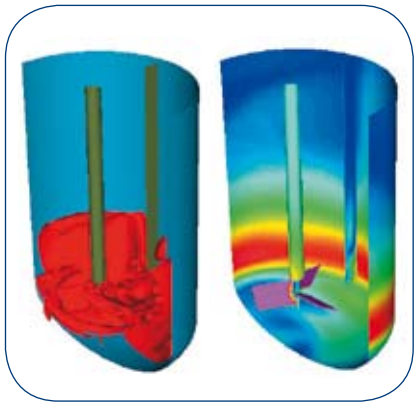
TURBULENCE STUDIES



SPEED PROFILE ANALYSIS AROUND MOVING PARTS



CALCULATION OF THERMAL DATA

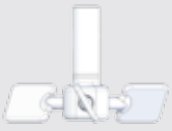
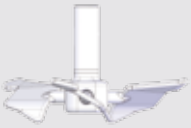


FLOW MODELLING

THE MAIN ADVANTAGES

- 3D Modelling
- Flow modelling
- Turbulence studies
- Mixing simulation
- Heat exchange calculation
- Optimization of the operating parameters

REMOVABLE AGITATORS WITH THE GLASLOCK® SYSTEM

	Flat blades 60°	Flat blades 90°	Hydrofoil blades	Optifoil blades	Rushton turbine	Trapezoidal blades	Crossed blades
							
	AE-CE-BE	AE-CE-BE	AE-CE-BE	AE-CE-BE	AE-CE-BE	AE-CE-BE	AE-CE-BE
	↓↑	←	↓↑	↓↑	←	←	↓↑
	●	●	●	●	●	●	●
	3 to 8	3 to 8	1 to 8	1 to 8	3 to 10	3 à 8	1 à 5
	6.000	7.000	6.000	8.000	3.000	6.000	70.000
	++	+	+++	++	-	Low min. agitated volume	++
	+++	++	+++	+++	-		+
	+	+++	+	+	++		-
	+	+++	-	-	+++		-
	+++	++	+++	++	+		+++
	+	-	+++	+++	-		++
	0,41 to 0,44	0,41 to 0,44	0,43 to 0,45	0,45 to 0,55	0,3 to 0,4	0,35 to 0,4	0,6 to 0,75

Low min. agitated volume

TOTALLY ADAPTED
TO EACH TYPE OF REACTION

Today, the major concerns of the chemical and pharmaceutical industries are improving performance and reducing production costs. Agitation, mixing and heat transfer are directly linked to this problem.

EVERYTHING DEPENDS ON THE ENAMELLING

The constant improvement of enamelling techniques makes it possible to optimize the profiles of agitator blades in enamelled steel. Our research and development teams have perfected a formulation which offers optimal resistance to highly corrosive processes, impact and abrasion, and facilitates cleaning and non sticking.

GLOBALLY UNIQUE TECHNOLOGICAL SOLUTIONS

De Dietrich® expresses its know-how in a totally unique offer. It brings together the contribution of the Optimix® concept, which optimizes the agitation procedure, and those of the GlasLock® system, which allows the individual assembly and removal of blades. The advantages are many: extreme versatility by optimizing the angle of inclination of the blades depending on the process, very high mixing performances, optimal adaptation of the blades to the process, high performance profiles giving low energy consumption, and a reduction in working time and spare parts stock.

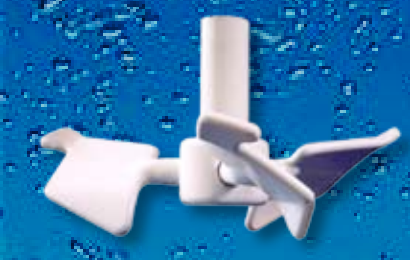
KNOW-HOW BASED ON LONG EXPERIENCE

The accumulation of industrial data and a significant research effort now makes it possible to use a scientific approach to agitation and heat exchange techniques, which were previously approached in an empirical way.

AN EXPERIMENTAL AND SCIENTIFIC APPROACH

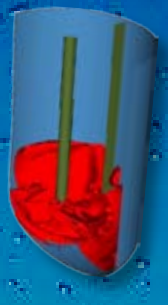
De Dietrich® is supported by dedicated numerical tools, specifically developed to study fluid mechanics. The combination of these tools with the De Dietrich® database enables precise modelling and analysis.

A SINGLE OBJECTIVE:
TO REDUCE THE OPERATING COSTS OF YOUR REACTORS IN ORDER TO INCREASE THE COMPETITIVENESS OF YOUR PLANTS



GlasLock®

Optimix®



The scientific approach

Enamel DD 3009

EXPERT
IN AGITATION TECHNIQUES

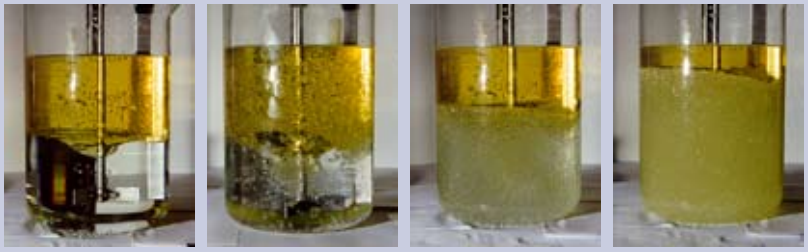
IN RESPONSE TO THE NEEDS OF INDUSTRY

Agitation and mixing can now be considered major process components in the chemical and pharmaceutical industries. But we can no longer speak of empirical methods. The accumulation of industrial data and a significant research effort currently favor a scientific approach to agitation techniques.

RECOGNIZED EXPERTISE

De Dietrich® bases its expertise on tests conducted on small-scale models, digital simulations and sustained collaboration with specialist laboratories. Result: De Dietrich® has confirmed its position as a primary partner in the design, definition and calculation of agitation.

HYDRODYNAMIC DESIGN: VALIDATION BY PILOT PLANT



MEASURING THE CRITICAL EMULSION SPEED OF TWO IMMISCIBLE PRODUCTS

VALIDATION BY PILOT

CALCULATION SOFTWARE

IN THERMAL TRANSFER

IN RESPONSE TO THE NEEDS OF INDUSTRIES

Aware of the importance of thermal transfer in the success of a process, De Dietrich® has constantly developed its expertise and know-how in order to optimize the thermal operation of its reactors. In order to provide the perfect response to the needs of its customers, De Dietrich® has developed its own thermal transfer calculation software and has acquired specific works equipment that enables it to produce the coil reactors that have become essential to a large number of processes. Today, De Dietrich® is capable of adapting perfectly to the processes and utilities of its customers.

DEDICATED THERMAL EXCHANGE CALCULATION SOFTWARE

De Dietrich® has developed a software package in tandem with specialist researchers, based on data acquired over several decades, that allows it to calculate accurately:

- The heat transition coefficient.
- The heating and cooling times.
- The thermal power levels needed for the heat transfer.
- The heat balance of your reactor.

THE COIL REACTOR

With the passing of time, the coil reactor has imposed itself as the optimum process solution. The improvement in thermal transfer is much greater than jacketed appliances.

These reactors offer several advantages:

- Forced flow: no dead areas, no deposits; self-cleaning.
- High pressure: maintenance of standard thicknesses that optimise the thermal flow.
- Low flow rate: reduction in the size of accessories such as pumps, valves, pipes, etc.;
- More accurate regulation by low system inertia.

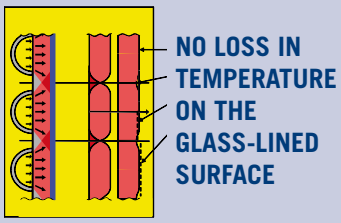
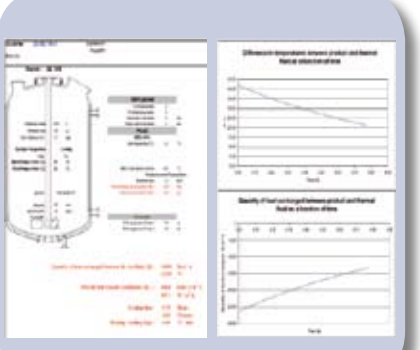


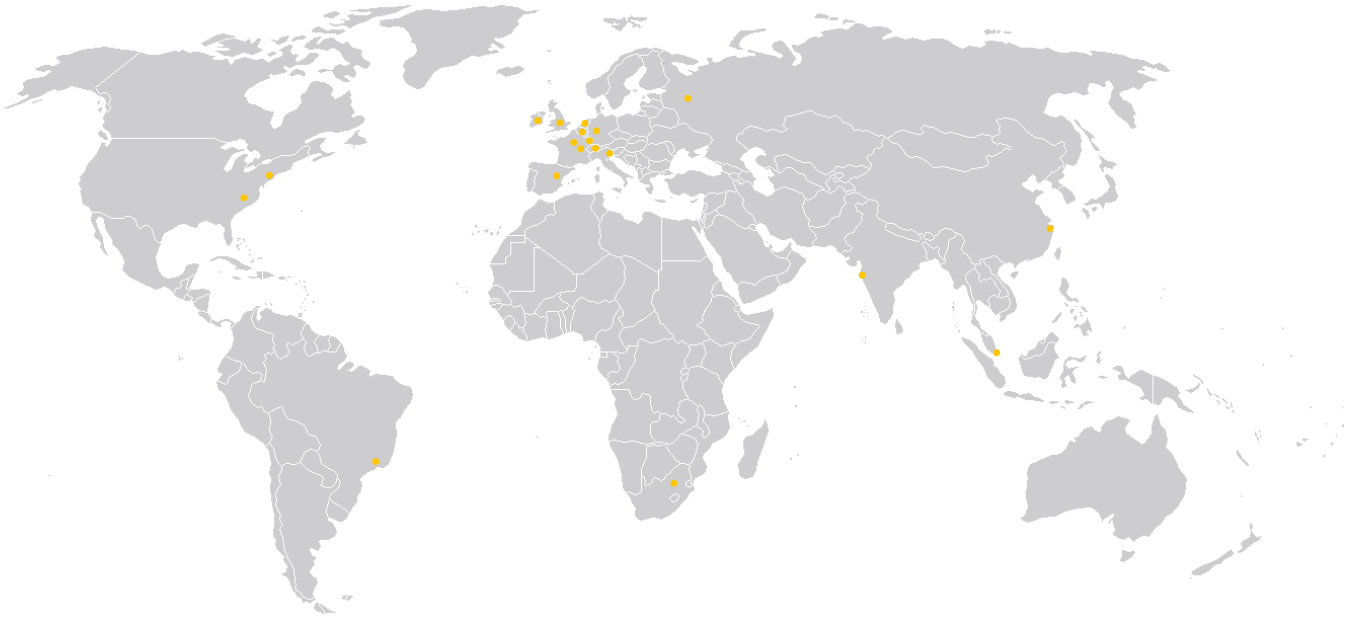
DIAGRAM OF THE THERMAL FLOW IN A COIL

AN APPROPRIATE TOOL: AUTOMATED WELDING = ENHANCED LIFESPAN, ERADICATION OF BUTT WELDS



THE KEY POINTS

- **Unchallenged know-how**
- **Long experience**
- **A dedicated calculation tool**
- **A single production tool**



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The international business group De Dietrich Process Systems is the leading provider of system solutions and reactors for corrosive applications as well as plants for mechanical solid/liquid separation and drying. The system solutions from De Dietrich Process Systems are used in the industrial areas of pharmaceuticals, chemicals and allied industries.

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