

Title: **The future of Chemistry: Continuous Flow Reactions**

Speaker(s) Massimo Bertoldi; (Pierre Giuliano; Christophe Bardin)

**LA MESTA CHIMIE FINE**

1336 route de l'Esteron

06830 GILETTE

France

Continuous flow technology is well known and is continuing to grow for new applications in the fine chemicals industry. This trend will not come to an end because intensifying processes brings many advantages and the chemists know very well the benefits on selectivity, productivity, etc

It is clear that the introduction of flow chemistry in the Fine Chemicals market will also have some consequences in the way manufacturing economy is organized. Many batch production factories have been dismantled in Europe and processes have been transferred to Asia for cost or HSE reasons.

Flow chemistry, involving intensification and miniaturization of the factory equipment, is changing our old factory concept: enormous investments, large plant, large tanks, and large batch vessels. Making hazardous conversions in a mini-flow-reactor allows reduction in solvent, water and energy consumption and the hazard exposure for the community as the volume involved in a flow reaction chamber represents less than one liter instead of cubic meters in a batch reactor.

This flow technology will modify our factory concept which will be smaller, closer to the industrial customer and able to perform all reaction steps in safe conditions.

La Mesta has developed its own continuous flow reactor, trusting in process intensification and offering this technology to the fine chemicals customers. Different reactions are running in regular production both in cGMP and not in cGMP: practical examples of carbonylation (CO at high pressure in corrosive solvent), hydrogenation (heterogenous and homogeneous catalysts at high hydrogen pressure and temperature), phosgenation, multi-steps synthesis, hazardous reactions (uncontrolled onset CO<sub>2</sub> gas evolution) and 'cryogenic reactions' run at 'high temperature' are disclosed in detail.

La Mesta is continuing to invest in this concept, now working on continuous downstream systems in order to integrate the total production chain in miniaturized systems and to fully exploit the advantages of continuous flow reactions. This will be done in steps. The first one is the continuous washing and decantation. A practical example of reaction (esterification), washing and separation steps in continuous at industrial scale is described in detail.

More and more customers of fine chemicals are looking at companies able to offer the above advantages.