



## Process intensification of liquid-liquid non-isothermal processes by using chemical reactor-heat exchanger (L/L HEX)

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The present document reports the work accomplished, from February 1998 to the end of September 2000, by "Équipe Thermofluides & Écoulement Complexes" of ISITEM (university of Nantes), in the framework of the Joule Project No. JOE3-CT97-0050. This partner will be referred to as ETEC, hereafter.

The task assigned to ETEC was mainly focused on the hydrodynamic characterization of Liquid/Liquid (L/L) flows in chemical reactor-heat exchangers. Although the device is supposed to be fed with reacting products, flow characterization experiments are to be carried out with non reacting fluids, for safety and practical reasons.

The studies to be performed by ETEC were of experimental type. As a consequence, the preliminary work consisted of purchase, design and construction of experimental facilities for the purpose of the project. These will be described in the chapters one, two and three where we address the generalities, single and two phase studies.

As have been explained in the periodic reports, characterization of a turbulent two phase L/L flow in a given geometry requires detailed information of the single phase turbulent flow occurring in the same geometry. Therefore, it has been agreed at the kick off meeting (Brussels, on 4th March 1998) that the first step of ETEC's experimental investigations focuses on a single phase flow characterization in turbulent regime. This work have been accomplished and has given satisfying results that will be presented in chapter.

The second step of the work was then focused on the two phase L/L flow. For this purpose, two experimental techniques have been developed to obtain accurate measurements of droplets characteristics. The techniques are based on a micro encapsulation operation. It required several calibration experiments that have been performed.

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