

RESEARCH LINE 5A	
COMPANY	Iberdrola
PhD THESIS SUPERVISOR (UPM)	Prof. Dr. Antonio Nieto-Márquez Ballesteros <i>Industrial Engineering School Mechanical Engineering, Chemistry and Industrial design Department</i>
PhD THESIS CO-SUPERVISOR (COMPANY)	Dña. Beatriz Crisostomo Merino Head of Innovation Management Iberdrola
DESCRIPTION OF THE PhD THESIS PROJECT	<p>Electric power demand. Applicability of new solutions in the decarbonization of the industrial energy model</p> <p>Currently, industrial activities consume huge amounts of energy, meaning more than 20 % of energy requirements in Europe and up to 30 % in USA. Up to a 50 % of this industrial consumption correspond to separation processes in chemical process plants, being distillation/rectification the most common operation. Worse than that, a high amount of this energy is wasted, due to the low yield of thermal process employed. The bottleneck for the reuse of this waste energy streams (gas or liquid) is their low temperature levels, making them unuseful for other heat transfer applications. However, there is a technology: "Heat pumps", that can upgrade such streams This technology has been widely employed in air conditioning applications, but its use has been developed to a much lower extent for industrial applications. There are many examples of distillation units where heat pumps can be applied. The aim of this thesis is to focus on the dehydration of an industrial solvent, namely methyl-isobutyl-ketone, widely applied in industries like painting or coatings. The industrial system to be studied consist on two main sub-systems:</p> <p><u>The rectification unit</u>, with a feed section, a column to enhance the contact between phases and the subsequent separation, a condensation of light product and generation of reflux and a reboiler to generate the vapour phase. Typically, heat is withdrawn in the condensator and supplied in the reboiler.</p> <p><u>Waste energy upgrading unit</u>, in order to thermally integrate the needs of heat in the reboiler and the heat removed in the condensator. This unit consist on a heat pump and the associated hydraulic circuits.</p> <p>In addition, other waste energy streams different from those corresponding to the distillation unit will be evaluated</p> <p>A deep study of distillation parameters is needed for a right design of the energy unit and the selection of the more suitable technology (direct vapour recompression, vapour ejector...). The evaluation of the system will be carried out through simulation and optimization tools (i.e. ASPEN PLUS) looking for a technical, energetic and environmental feasible configuration. Practical contact with real equipment (Iberdrola) will allow for a deeper study and a better design.</p>
Tentative SECONDMENT(S)	Budapest University of Technology and Economics
TRAINING ACTIVITIES	The doctoral programme that the predoctoral researcher will join, contemplates a minimum number of training activities per year, including courses in scientific writing, preparation of communications, handling of bibliographic sources, etc. In addition, the student will attend at least one specific course on the use of commercial chemical process simulators, either in online or face-to-face format.
REQUIREMENTS FOR CANDIDATES	BSc and MSc in Chemical/Process Engineering Strong skill in mass transfer operations and process simulation