Laura Annamaria Pellegrini is Full Professor of Chemical Plants (ING-IND/25) and is currently teaching “Unit Operations of Chemical Plants” to undergraduate students in Chemical Engineering and “Chemical Process Technologies” to graduate students in Energy Engineering.

She leads GASP (“Group on Advanced Separation Processes & GAS Processing”), a group involved in research activities and projects regarding mainly the purification of sour gases and CO_2 capture by chemical or physical absorption or by cryogenic techniques. The focus is both on the process simulation, with particular attention to energy saving, and on the thermodynamic characterization of the systems, by the choice and the proper calibration of Equations of State, mixing rules and methods.

Her research interests focus on modelling and simulation of separation processes and reacting systems in steady state and under transient conditions, using also commercial simulation packages like Aspen Plus®, Aspen Hysys®, Promax®.
She has a significant scientific production on hydrocracking modelling, due to a past cooperation with Eni S.p.A.. A model of the trickle-bed reactor for the hydrocracking of the Fischer-Tropsch waxes (n-C_5/C_{70} mixture) was worked out, taking into account both kinetic and thermodynamic factors. As to kinetics, a pathway-level scheme, based on the Langmuir-Hinshelwood-Hougen-Watson mechanism, with a proper breakage probability for the C-C bonds, was built while, from a thermodynamic standpoint, the VLE calculation and a function depending on temperature and carbon atom number for the equilibrium constants of isomerization reactions, were introduced.
In the field of thermodynamics, she collaborated with Ing. Giorgio Soave on thermodynamic modeling of VLE and of VLLE and has an ongoing collaboration with CTP (Center Thermodynamics of Processes) of MINES ParisTech in Fontainebleau mainly on equilibria involving solid phase formation, a key topic for process validation under cryogenic conditions. For this purpose, she has studied the modelling of SLVE by means of the Yokozeki Equation of State that allows to predict equilibria adopting a unified approach for all the phases, comparing the results with the ones obtained following the “classical” approach.
A significant research topic concerns Acid Gas Removal (AGR), recently focused on absorption with aminoacids. Chemical absorption with MEA, MDEA and PZ has been studied, with an accurate thermodynamic and kinetic characterization of CO_2 and H_2S as well as of impurities like aromatics, mercaptans, COS. By developing adequate thermodynamic/kinetic/mass transfer models according to a multiphysics approach, “ad hoc” subroutines have been written and they are currently used by engineering companies for the design of natural gas purification plants. The same routines have been applied to the study of energy optimized configurations for CO_2 capture from power plants (pre-combustion and post-combustion), as well as to biogas upgrading.
As to cryogenic techniques for AGR, Laura Annamaria Pellegrini is the inventor of the patent “Process for the removal of CO_2 from acid gas”, that was filed (2013) in Europe, USA, Saudi Arabia/GCC countries, Iran and Venezuela. The distillation process is based on a thermodynamic cycle that avoids the formation of dry ice. The influence of other mixture components on the process has been pointed out by properly defining the thermodynamic framework, also in view of downstream separation processes. An energy analysis has been carried out in order to assess the energy requirements for the recovery of Natural Gas Liquids

(NGLs) when the low-temperature distillation process is applied; the process performances have to be compared with the ones of traditional purification methods (amine washing), in order to define the trade-off between the two technologies under different possible feed stream compositions extended to the overall production chain. Preliminary results prove the feasibility of the low-temperature purification process when dealing with gases having high amounts of acidic compounds and different concentrations of NGLs. A pilot plant of this dual pressure low-temperature distillation process is now in operation.
Laura Annamaria Pellegrini has been recently involved in the study of downstream separations in the production process of butanol through acetone-butanol-ethanol (ABE) fermentation of lignocellulosic biomasses (LIDIA project of Cluster Nazionale Chimica Verde). The study regards the synthesis of the optimal process configuration for the in-situ recovery of butanol from a batch fermentation unit, in which the product is recovered from the fermentation broth by means of nitrogen gas stripping.

Laura Annamaria Pellegrini is member of the European section of the Gas Processors Association.
She is associate of Istituto Nazionale di Fisica Nucleare and she is involved in the DarkSide collaborations and in the ARIA project for the production by cryogenic distillation of Argon depleted in ^{39}Ar.
She has collaborations in Italy and worldwide, including: MINES ParisTech, University of Sydney, Budapest University of Technology and Economics, Centre Thermodynamique des Procédés, MINES ParisTech, Princeton University, Istituto Nazionale di Fisica Nucleare, National Institute for RD of Isotopic and Molecular Technologies of Cluj-Napoca, Università Statale di Milano.
She has been involved in several projects funded by public institutions and is/was project manager of research contracts between Politecnico di Milano and external companies, mainly Oil and Gas Companies and Engineering groups.
Laura Annamaria Pellegrini is author and co-author of more than one hundred and fifty scientific publications released on international journals and books or presented in national and international conferences.
She has operated as referee of International Congresses and as peer reviewer for international journals
She has been advisor/external reviewer of several Italian and foreign PhD theses.