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Potential for Massive Use of Biodiesel for Automotive in Italy

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Abstract : The context of this research is that of the Italian reality, which, in order to adapt to the EU Directives that prohibit the production of internal combustion engines in favor of electric mobility from 2035, is extremely concerned about the significant loss of jobs resulting from the difficulty of the automotive industry in converting in such a short time and due to the reticence of potential buyers in the face of such an epochal change. The aim of the research is to evaluate for Italy the potential of the most valid alternative to this transition to electric: leaving the current production of diesel engines unchanged, no longer powered by gasoil, imported and responsible for greenhouse gas emissions, but powered entirely by a nationally produced and eco-sustainable fuel such as biodiesel. Today in Italy, the percentage of biodiesel mixed with gasoil for diesel engines is too low (around 10%); for this reason, this research aims to evaluate the functioning of current diesel engines powered 100% by biodiesel and the ability of the Italian production system to cope to this hypothesis. The research geographically identifies those abandoned lands in Italy, now out of the food market, which is best suited to an energy crop for the final production of biodiesel. The cultivation of oilseeds is identified, which for the Italian agro-industrial reality allows maximizing the agricultural and industrial yields of the transformation of the agricultural product into a final energy product and minimizing the production costs of the entire agro-industrial chain. To achieve this objective, specific databases are used, and energy and economic balances are prepared for the different agricultural product alternatives. Solutions are proposed and tested that allow the optimization of all production phases in both the agronomic and industrial phases. The biodiesel obtained from the most feasible of the alternatives examined is analyzed, and its compatibility with current diesel engines is identified, and from the evaluation of its thermo-fluid-dynamic properties, the engineering measures that allow the perfect functioning of current internal combustion engines are examined. The results deriving from experimental tests on the engine bench are evaluated to evaluate the performance of different engines fueled with biodiesel alone in terms of power, torque, specific consumption and useful thermal efficiency and compared with the performance of engines fueled with the current mixture of fuel on the market. The results deriving from experimental tests on the engine bench are evaluated to evaluate the polluting emissions of engines powered only by biodiesel and compared with current emissions. At this point, we proceed with the simulation of the total replacement of gasoil with biodiesel as a fuel for the current fleet of diesel vehicles in Italy, drawing the necessary conclusions in technological, energy, economic, and environmental terms and in terms of social and employment implications. The results allow us to evaluate the potential advantage of a total replacement of diesel fuel with biodiesel for powering road vehicles with diesel cycle internal combustion engines without significant changes to the current vehicle fleet and without requiring future changes to the automotive industry.

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