# APPLICATION OF PRESSURE AND SCF TECHNOLOGY IN A WORLD SCALE PROCESS

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## ABSTRACT

Talking about processes utilizing supercritical fluids nowadays carbon dioxide is probably the first medium that comes in mind. It is often overlooked, that α-olefin processes make excessive use of the benefits of a supercritical fluid, such as good solvent power and excellent properties with respect to heat and mass transfer. In some processes the monomer itself acts as educt and process fluid at the same time. Another aspect that is frequently not realized is the scale of such processes. A worldwide consumption of approximately 300 Mt of polyolefin polymers per year demands production on very large scale. Typical world-scale plant have a production capacity of more than 300 kt per year. Another reason for this scale is the economic pressure that lies on the production of such commodities. In all, large production scale, the desire to design application properties by process conditions in advance with a minimum of trial and error together with the demanding process technology produce a permanent requirement for development and scientific investigations.

Low-density polyethylene (LDPE) is produced by a high-pressure process at pressures up to 3500 bar and temperatures up to 300 °C. These are extraordinary harsh reaction conditions that demand advanced process technologies and significant safety precautions. Regarding its lifetime of several decades this process is often seen as a mature technology. However, although several varieties of polyethylene have been discovered that are produced by the help of catalysts at conditions being milder, still the unique rheological properties of LDPE cannot be mimicked. So-called long-chain branches determine these properties. Such side branches to the main backbone are being formed by the complex reaction kinetics of free-radical polymerization kinetics featuring inter-molecular transfer reactions to polymer. Therefore, still LDPE has a marked share of several million tons per year worldwide. Unique material properties, commercial relevance and demanding process technology make this process still to an attractive object of investigation. In parallel metallocen catalysts are applicable to this process, too. Narrow molecular weight distributions of material with excellent organoleptic properties are the resulting material. It provides a second alternative of access to products of unique properties for this technology.

Starting with an overview of this technology the actual trends of development will be inspected using examples. Driving forces and strategies will be elucidated.