

# POLYMER PRODUCTION

## OPTIMISING VACUUM PUMPS AND SYSTEMS FOR POLYMER PRODUCTION ON INDUSTRIAL SCALE

Polymers are manufactured by polyaddition or polycondensation polymerisation reaction. Monomers react to form polymer chains which are extruded into pellets by the extrusion process. These pellets are used to manufacture a wide array of plastics.

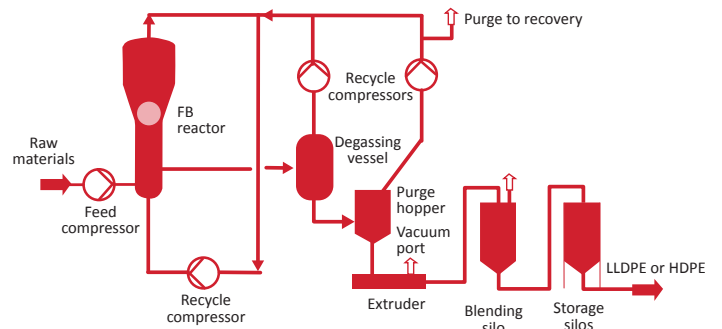


Polymerisation is continuously carried out in reactors where monomers such as propylene ethylene and hydrogen are introduced to the reactor by vacuum feed. Solid catalyst kick-starts the formation of polymers generating unfavourable heat which is dissipated and regulated. The unreacted monomer is recycled, cooled and compressed and then pumped back into the system using a vacuum system to ensure that the monomer is polymerised to specifications.

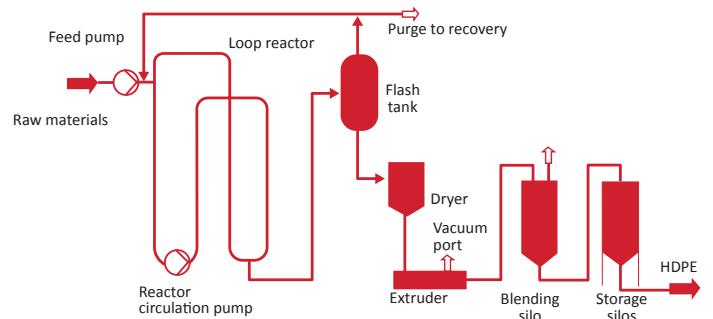
Once the polymer is formed, it is removed from the reactor and passed through a series of polymer gas separation steps. Carrier gas containing additives is infused with the polymer to deactivate the catalyst and unreacted monomer is recovered via the vacuum system.

The polymer is then pumped out into the purge vessel where nitrogen is circulated by vacuum systems to stabilise the polymer and remove any moisture and volatile materials. The powder is transferred to the powder silo where it awaits the extrusion and mixing process.

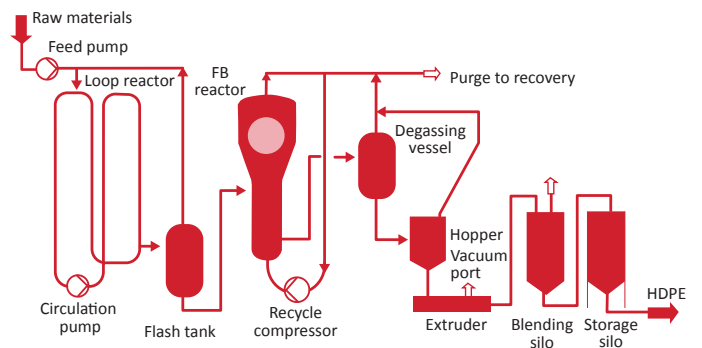
Polymerised powder along with additives is extruded where it is gradually melted, and volatile gas is removed via a vacuum port. The molten polymer is forced through a cutting die, cooled and pellets are formed. The pellets are then driven into a dryer and are transferred to a series of mixing silos for storage which are then compounded and formed into plastic products.



Gas Phase Reactor Process



Slurry Reactor Process



Slurry process configurations using a Double-Tube Loop Reactor followed by a Gas Phase Reactor

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### 1. CHALLENGE

Vacuum pumping systems need to handle organic solvents and compounds in a reliable and safe way while ensuring control, and the reduction of environmental pollution and cost of ownership.

At any given point in time, the pressure and the temperature in the reactor needs to be maintained for the Polymerisation reaction to occur consistently. Vacuum systems extract untreated monomers, transfer monomers, catalysts, additives, purge gases, etc.

Typical installations require a combination of a vacuum pump and/or a booster with with inlet condensers, inlet knockout pot without or without filter element, inlet gas/solvent purge, and exhaust condenser/ receiver vessels.

### 3. MAIN BENEFITS

Our expertise in chemical processes and applications know-how will allow us to propose the right chemical pump for this application. Our vacuum systems are capable of pumping a comprehensive range of organic and inorganic materials, flammables and corrosives, with excellent liquid and solids handling capabilities, ensuring high reliability in every condition.

### 2. SOLUTION

Polymerisation reactions will typically require ATEX vacuum systems. Our dry pumps are designed to minimize maintenance interventions and to lower utilities consumptions for a low cost of ownership.



CXS – ATEX version



EDP chemical system



EDS – ATEX version

## SUCCESS STORIES

Edwards has delivered a number of reliable and customised vacuum solutions to leading polymer producers over the world.



EDP250 with accessories installed at a German polymer producer