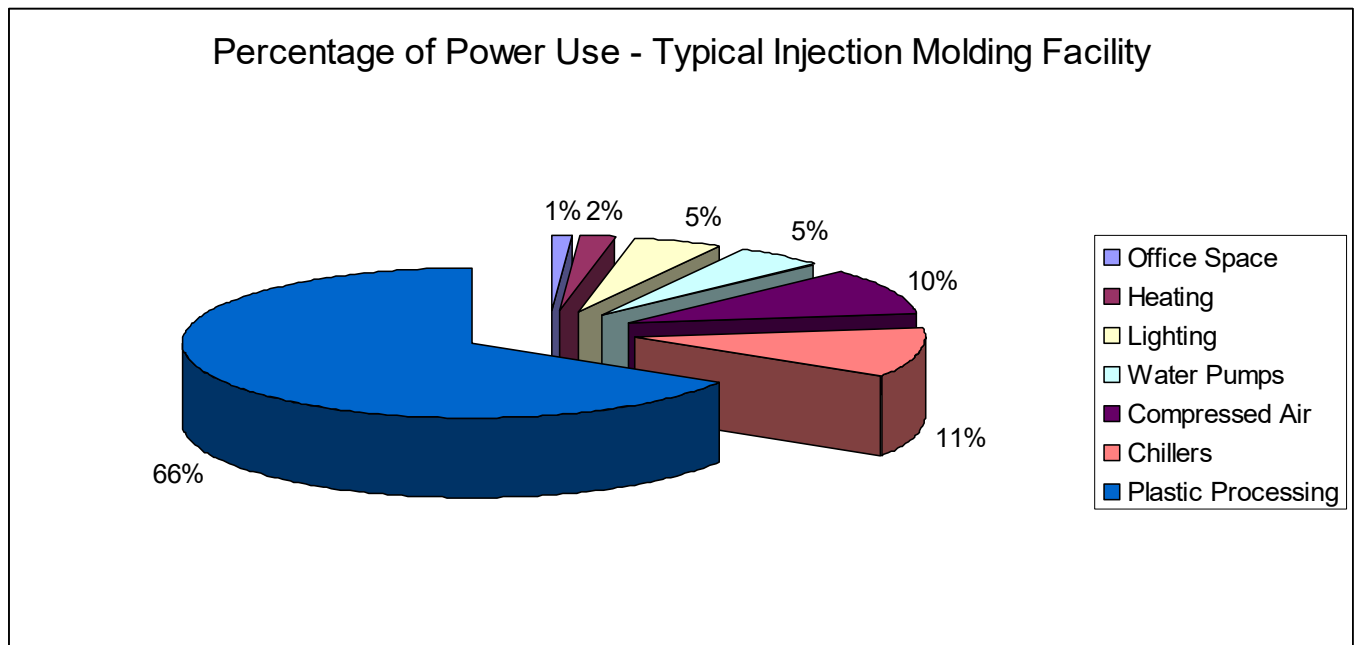


Injection Molding Facility Energy Consumption Summary

A key benefit of TCS is its ability to save energy and as such, a general understanding of energy consumption, in Injection Molding facilities, is necessary to best understand how TCS can fit into an Injection Molder's energy reduction strategy.

Primary cost drivers for Injection Molding companies include Resin, Labor and Energy

While many companies focus on Lighting or Compressed Air, Plastics Process (Injection Molding Machines) constitute the bulk of Energy Consumption according to published literature.



Barrel Heating is estimated to constitute 15%-40% of that energy cost associated with Plastics Processing.

Injection Molding facilities tend to consume 0.9 – 1.6 kWh/kg to process plastics, depending on their processing efficiency.

Many factors impact the % of power consumed by barrel heating during processing, the most important of which is the ratio of heat added by Shear versus Barrel Heaters.

Providing excessive heat to the process via Shear can cause accelerated barrel/screw wear, undue stress on screw drivers (motors), create inconsistent processing temperatures and consume excessive energy by screw motors.



While data varies, conventional wisdom is that barrel heating associated with Injection Molding requires 0.20 – 0.35 kWh/kg

Improved processing consistency (temperature) improves (reduces) part weight and tensile stress variations.

Notes:

Typical Energy Saving Strategy Blueprint:

- Eliminate obvious waste such as unnecessary lights in warehouse spaces or running empty conveyors
- Improve Barrel Heating Approach to improve Efficiency
- Eliminate Air Leaks which create constant Air Compressor Load
- Install LED Lights
- Buy Energy Efficient Equipment, when new Equipment is necessary:
 - All Electric Injection Molding Machines
 - High-Efficiency Air Compressors
 - Energy Efficient Chillers
- In some regions, factories are installing Solar Panels and Windmills to generate their own electricity, and sell it back to the grid when possible.

Idle Machines:

- Idle machines can consume 50-75% the energy of an operating machine due to barrel heating, hydraulic pumps and auxiliary equipment.
- An idle machine fitted with TCS will consume as much as 80% less energy compared to a machine fitted with traditional band heaters.
- Energy cost for an idle machine varies substantially with machine size, but averages of \$15-\$20/hr are provided in literature, meaning 1 hour of idle time/week costs \$500-\$1,000/year
 - TCS can greatly reduce this cost

Energy Costs:

- When determining Electricity Cost, a fully loaded rate including transmission costs, taxes and riders, should be calculated, rather than using the Base Rate, often provided by Accounting

Energy Incentives:

- Many Utilities offer incentives based on energy reduction efforts. A page on the website is dedicated to this topic
- Some Utilities also increase energy costs, per kWh, if continuous improvement is not employed. They do this via annual cost contracts with Factories

Maximum Energy Allowance:

- Some companies are constrained by energy consumption limits imposed by their utility and are not able to grow that facility (add machines) without energy conservation efforts.