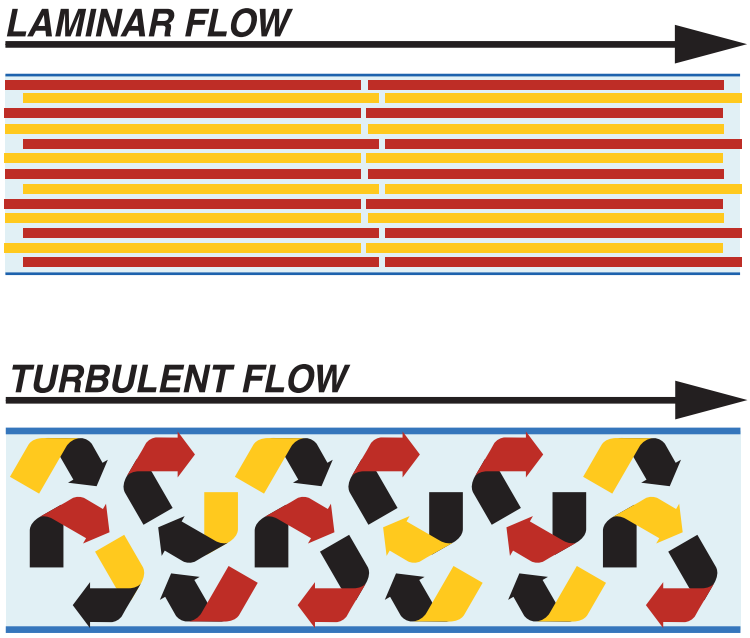
SUBJECT: TURBULENT VS LAMINAR FLOW **#7-A-156** **9/06/1995**

Heat transfer is the ability to pass heat between a warmer object to a cooler object.

In plastics processing, heat transfer is used to heat or cool objects such as molds, rolls, vessels, heat exchangers and others.

These objects have a system of channels "molded" into their bodies. Water (or some other fluid) is pumped through these channels in an effort to heat or cool these bodies.

When fluid is pumped through these channels, it can develop two basic characteristics: laminar or turbulent flow.



LAMINAR FLOW is defined as fluid gliding through a channel in smooth layers, where the innermost layer flows at a higher rate than the outermost.

TURBULENT FLOW is characterized by turbulence, where fluid does not flow in smooth layers but is agitated.

Heat transfer occurs at the channel wall. Laminar flow develops an insulating blanket around the channel wall and restricts heat transfer. Conversely, turbulent flow, due to the agitation factor, develops no insulating blanket and heat is transferred very rapidly.

Turbulent flow occurs when the velocity in a given water channel is high. Although too much velocity can cause erosion. Many equipment manufacturers publish specific flow and supply pressure requirements to achieve turbulent flow.

Supply pumps should be designed for the flow and pressure requirements of the process. However, actual flow and velocity will depend on proper design and installation of the system. Supply and return plumbing should be designed for minimum restriction to flow. (Minimum elbows, oversized quick connects, full size pipes and hoses).

Turbulent flow also will extend the useful life of the process tooling by slowing the buildup of precipitates on the heat transfer surface.

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