

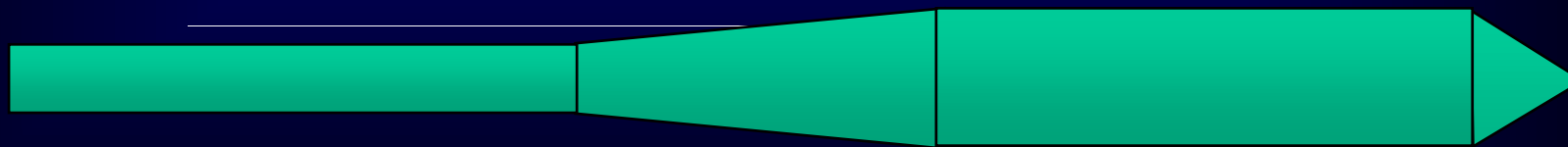
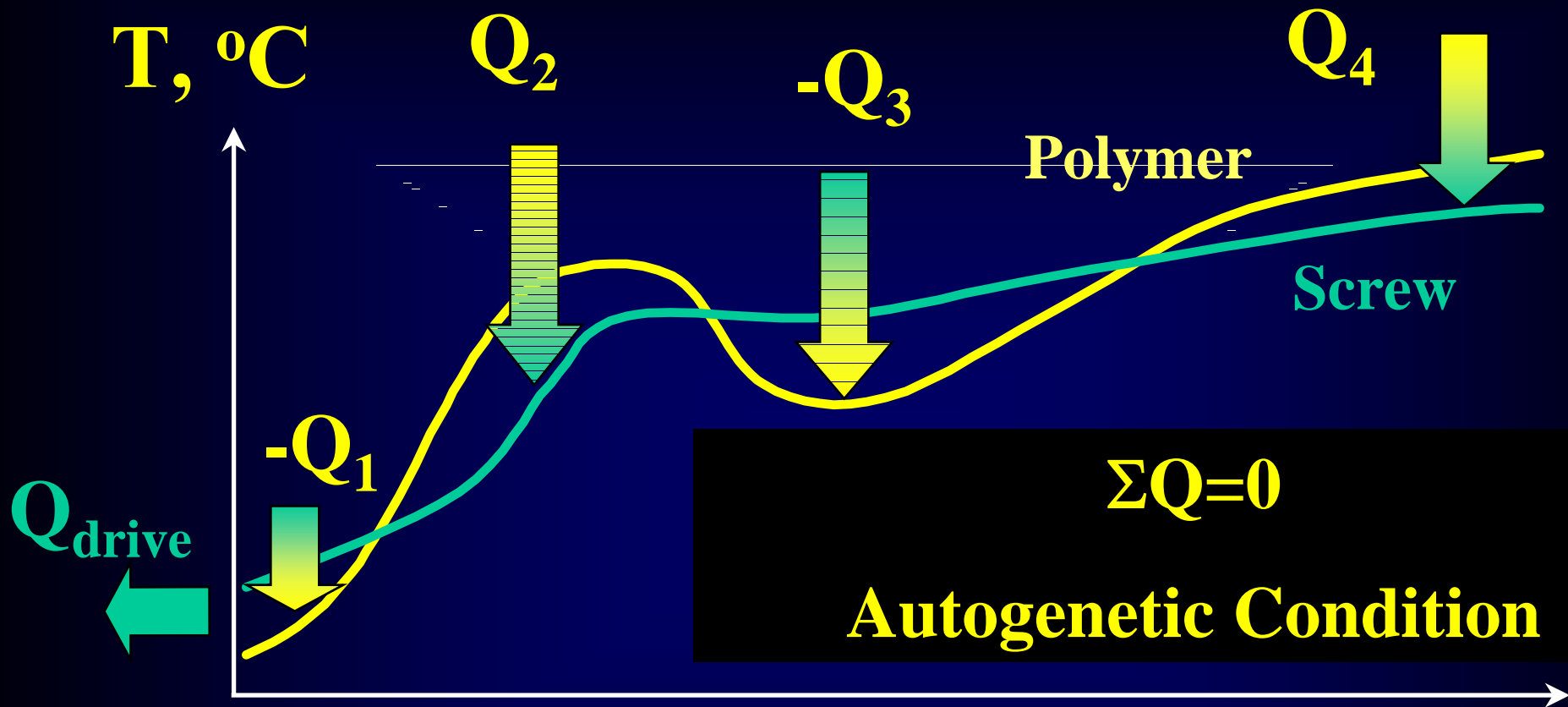
Heat Conduction in Extruder Screws

by

Stephen J. Derezinski, Ph.D.

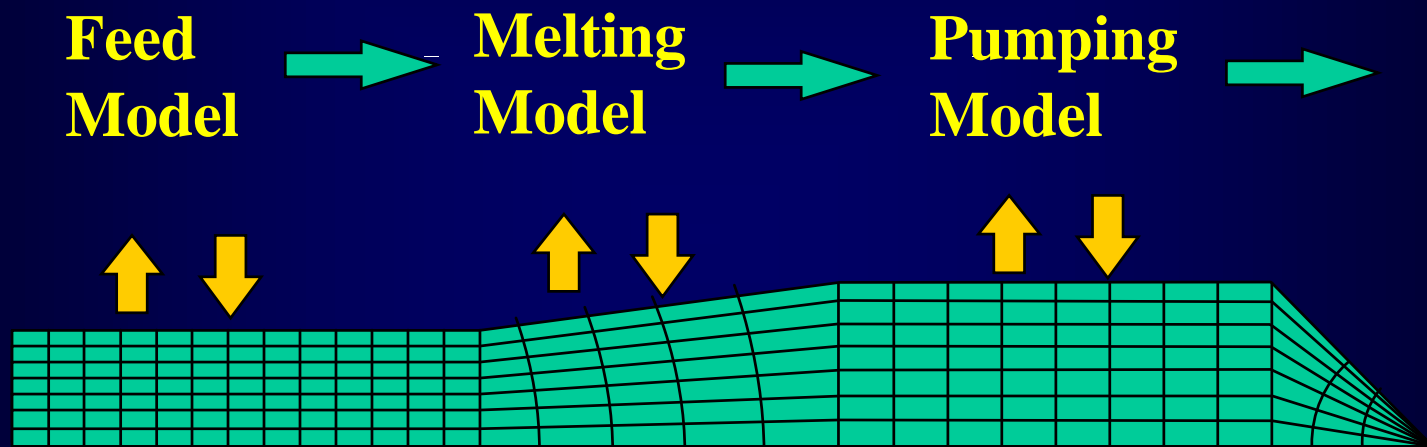
Extruder Tech, Inc.

An extruder screw
operates
autogenetically,
not **adiabatically.**



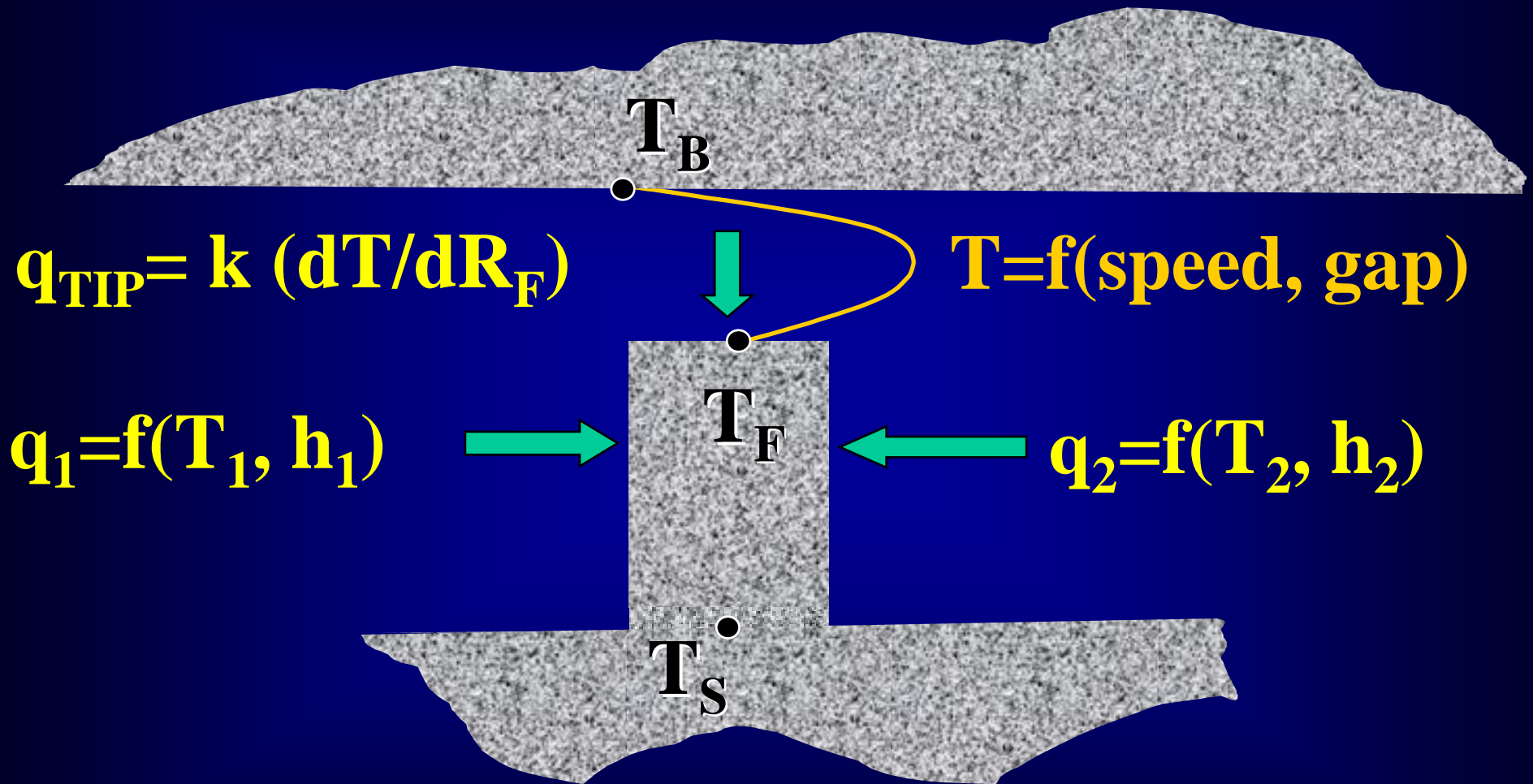
A comprehensive extrusion model with two-dimensional transient heat conduction in the screw demonstrates the phenomena.

Conduction in the Screw Body Coupled with Extrusion



**Grid for Heat Conduction in Cylindrical or
Spherical Coordinates**

Conduction in the Flight



Steady State Screw Temperatures

Extruder Tech, Inc.

Case Study: Four Extruders

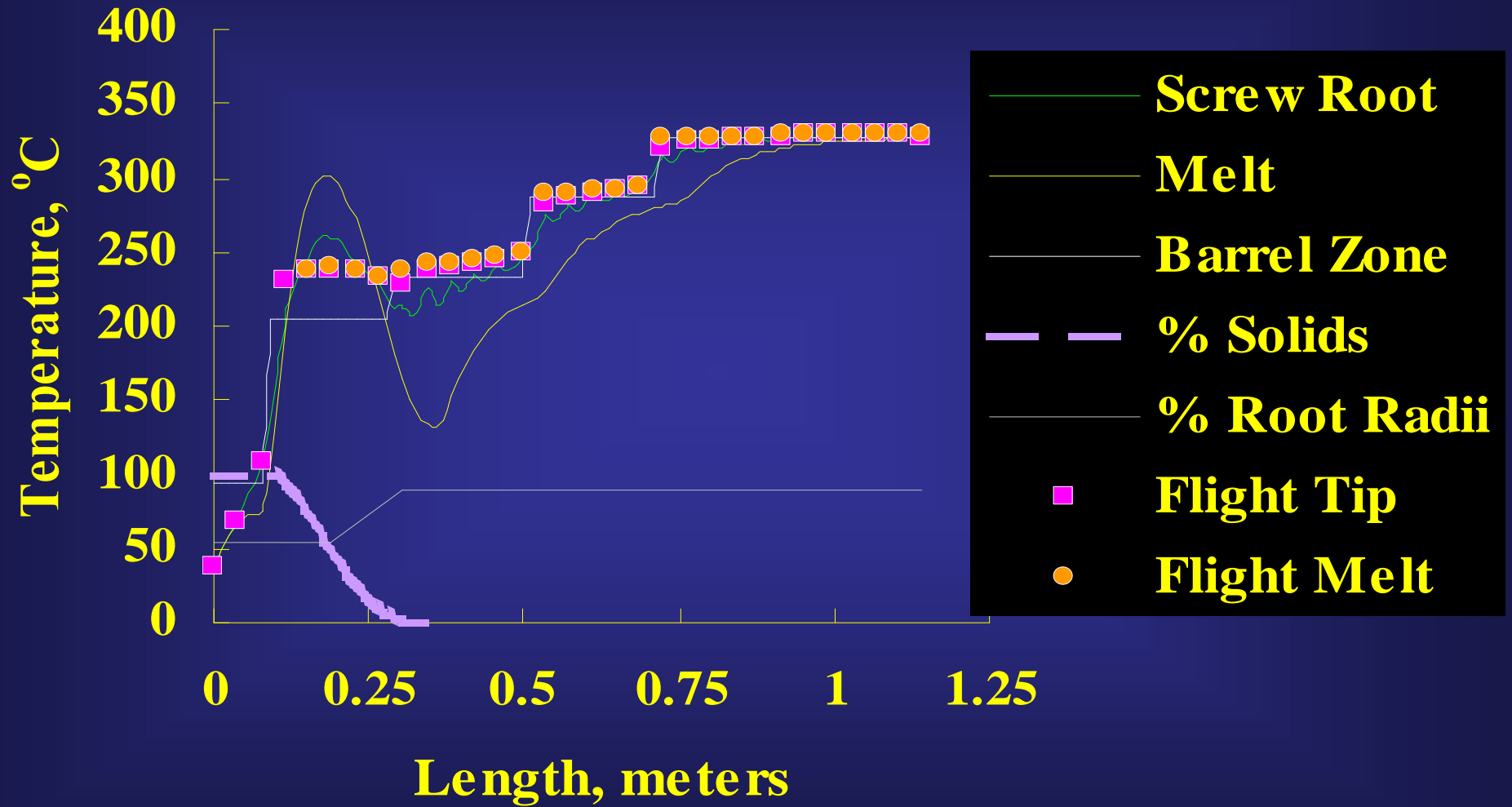
38.1 mm, 250 rpm

63.5 mm, 200 rpm

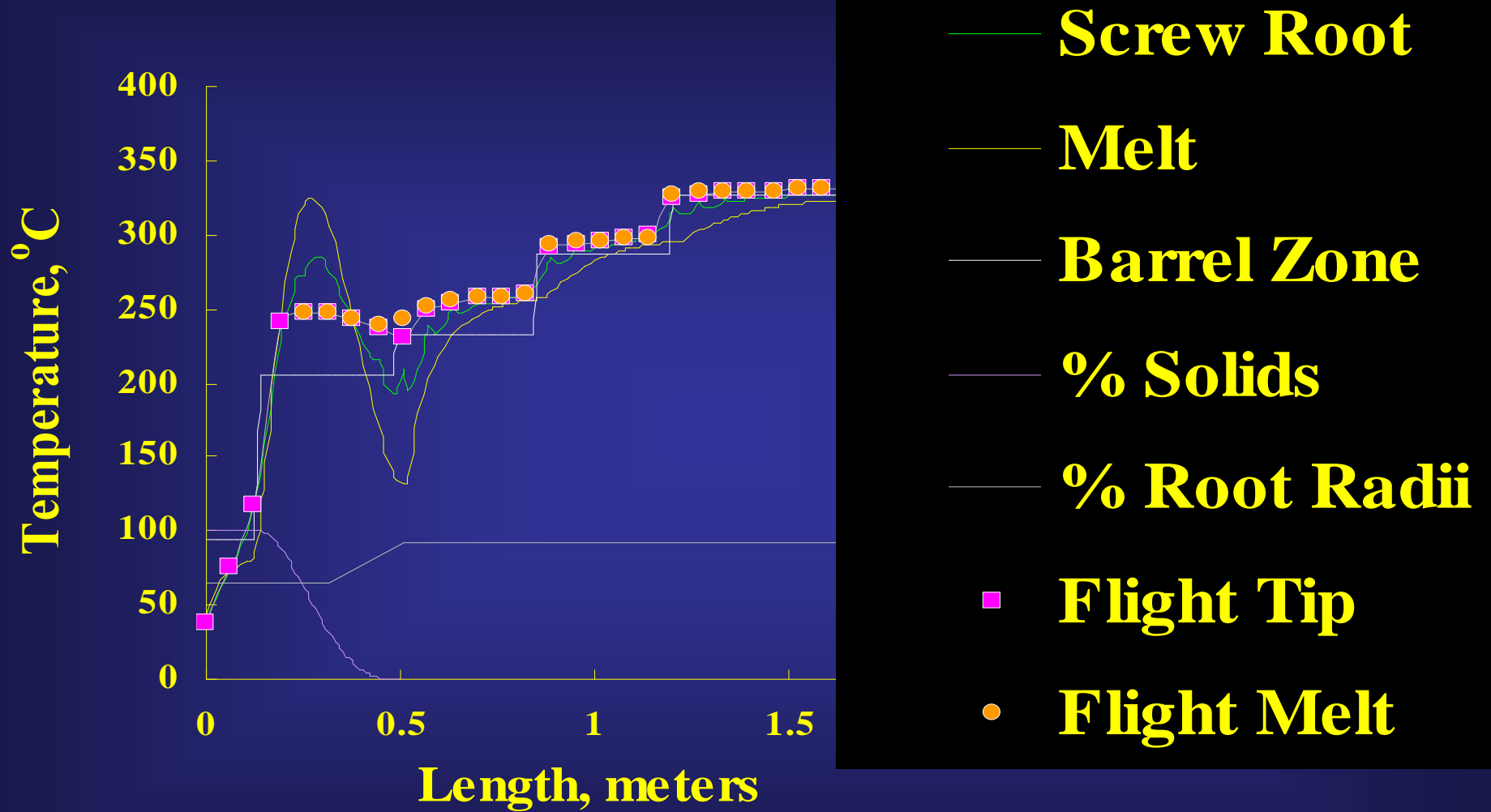
114.3 mm, 150 rpm

203.2 mm, 80 rpm

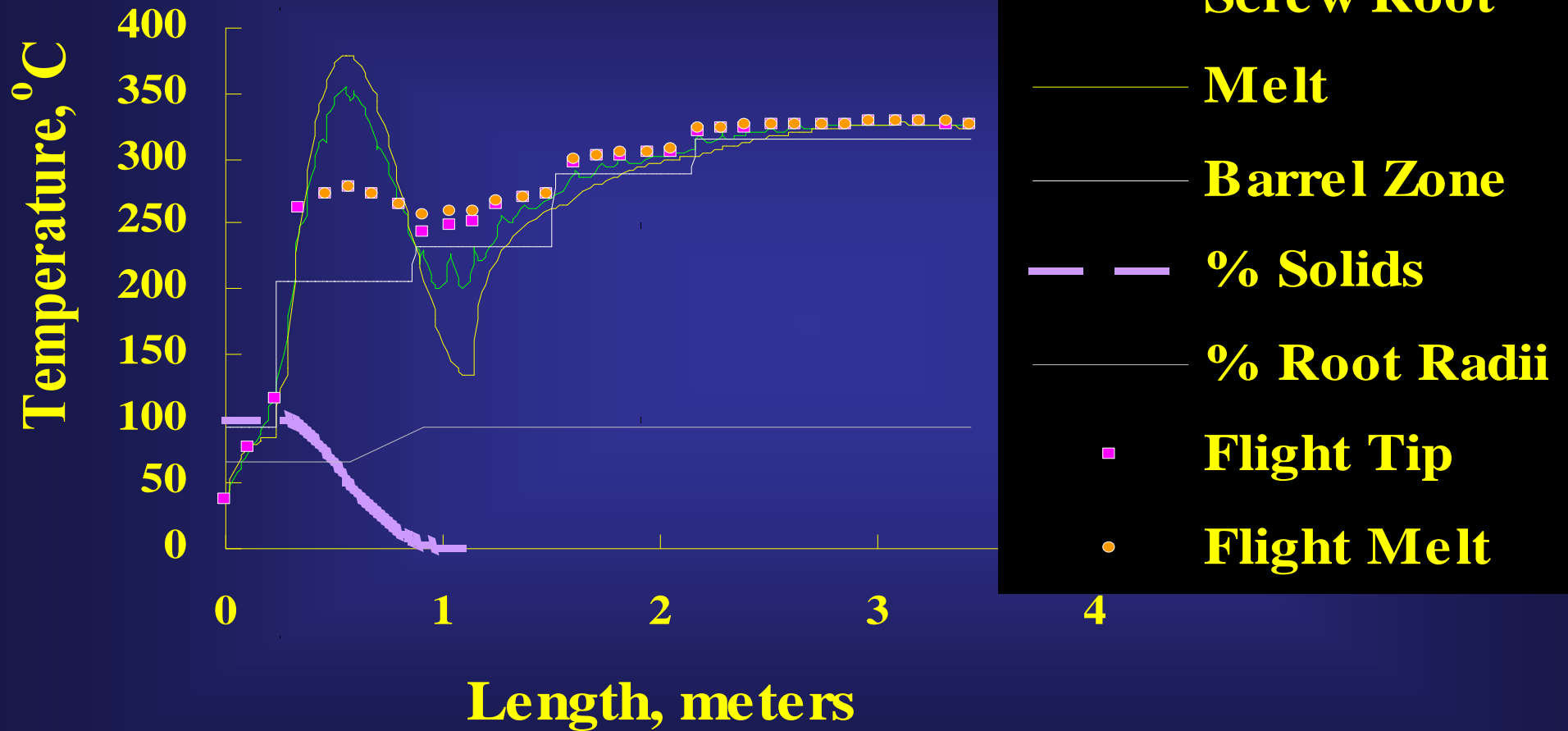
38.1 mm, 250 rpm



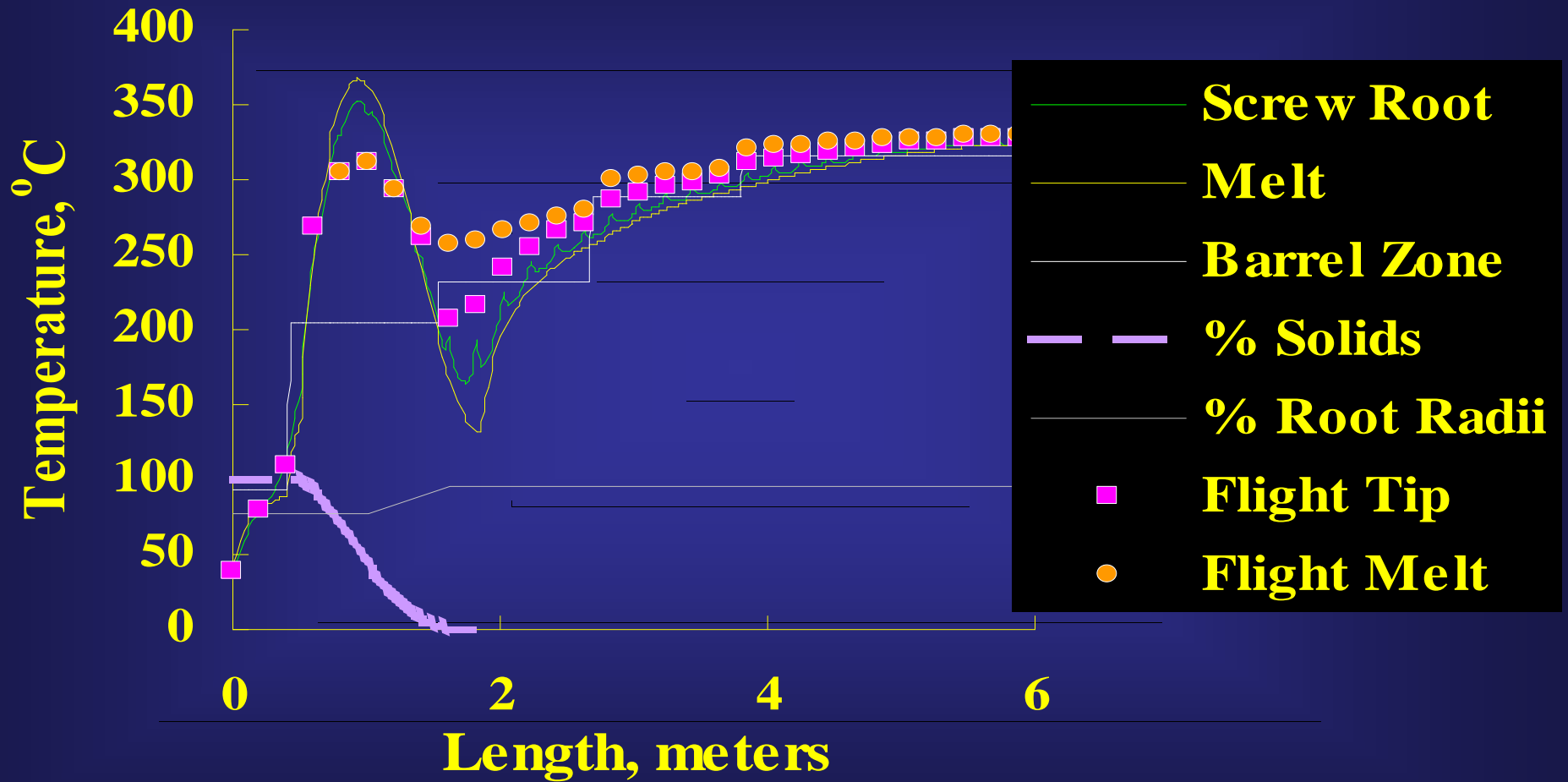
63.5 mm, 200 rpm



114.3 mm, 150 rpm



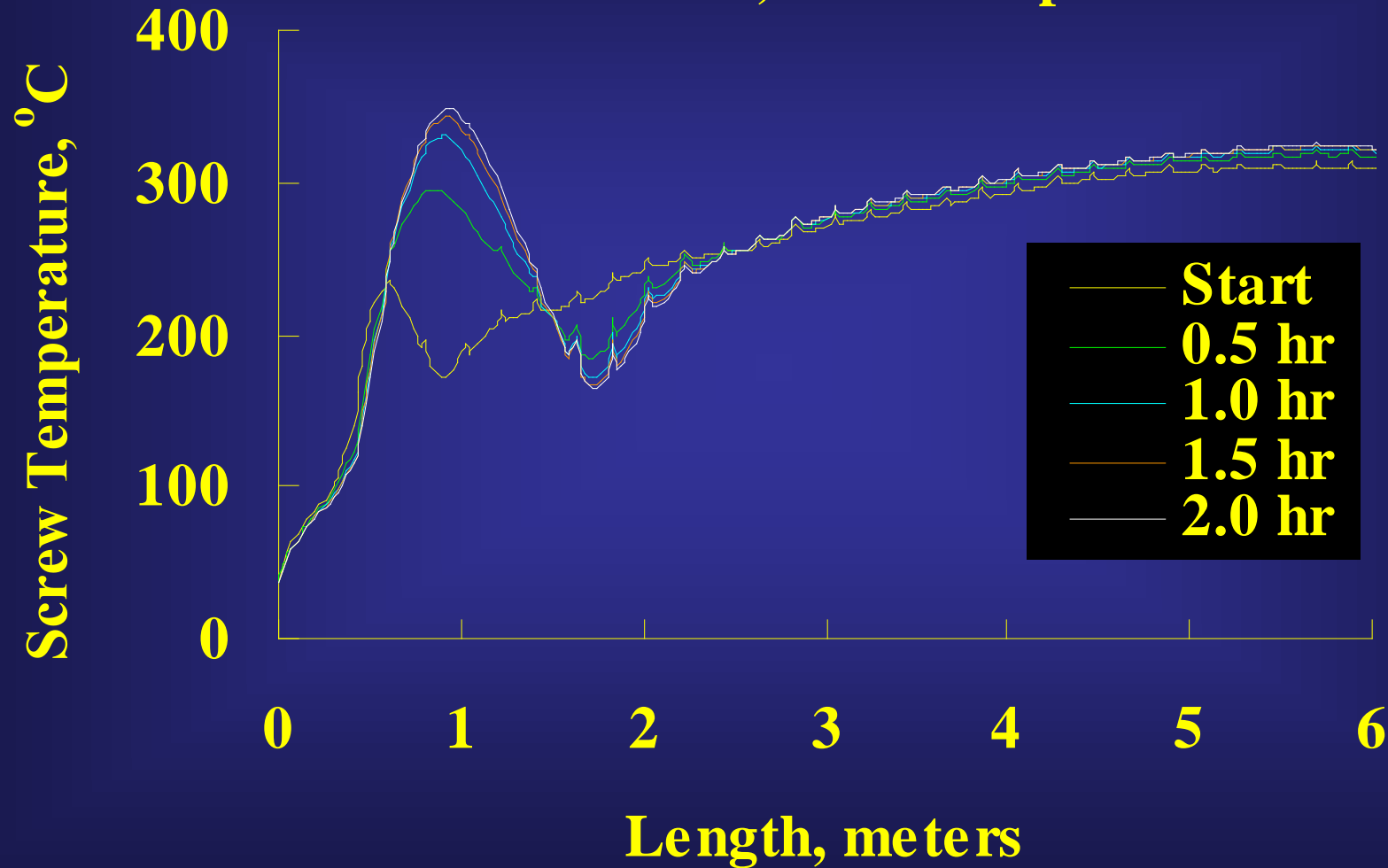
203.2 mm, 80 rpm



Thermal transients
are important.

SPEED CHANGE TRANSIENT

203.2 mm, 40 to 80 rpm

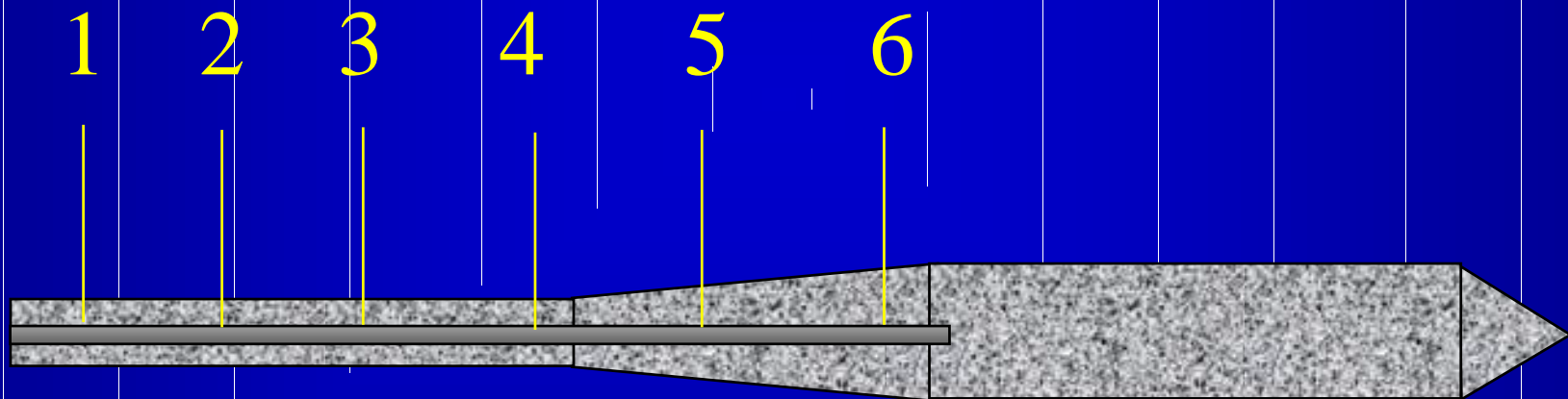


For Steady State

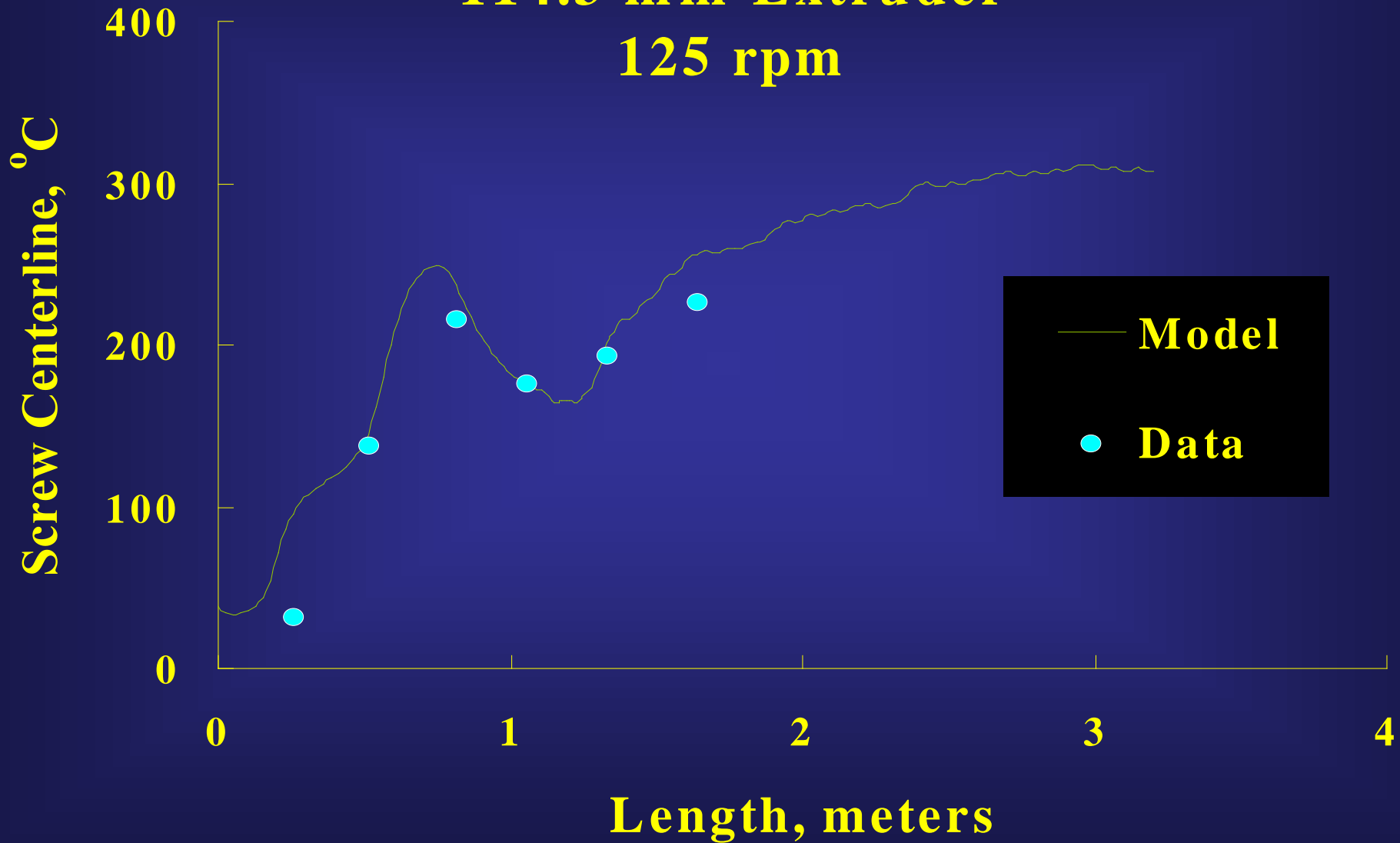
$$\text{Time(hrs)} = 50(D, \text{m})^2$$

Experimental Screw Temperatures

Screw Bore Temperature Measurement



Screw Centerline Temperature 114.3 mm Extruder 125 rpm



**A comprehensive model
of extrusion shows
that the screw is
thermally *autogenous*.**

***Thermal transients* are
important, especially
for large machines.**