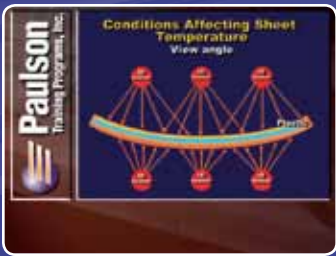
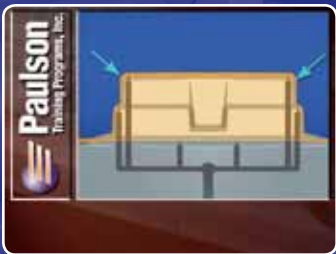


# Thick Sheet Thermoforming



Thick sheet or heavy gauge thermoforming is a process that transforms a flat sheet of plastic into a functional form used to create a wide variety of consumer and industrial plastic parts. While simple in concept, thermoforming is a complex process requiring knowledgeable and skilled personnel at all levels in the plant.

These five lessons teach the fundamentals of the thermoforming process, how to quickly solve problems and how best to develop advanced troubleshooting skills. Many of the conditions that cause part defects are explained. Personnel taking this course will become knowledgeable of the process, the characteristics of thermoformed parts and the most common causes of part defects.

- ◆ This in-depth course offers complete training on all aspects of day-to-day thermoforming production and will:
- ◆ Show and describe each step of the thermoforming process using actual in-plant footage and high definition 3D animation.
- ◆ Describe the best way to effectively heat the plastic based on material properties
- ◆ Explain the effects on the formed parts of each step in the process: heating, forming and trimming.
- ◆ Teach how to optimize control settings and thermoforming for maximum efficiency and profit.

Recommended For: Machine Operators, Setup Personnel, Process Technicians, Maintenance Technicians, Process Engineers, Project Engineers

## Thick Sheet Thermoforming

**1**

**Lesson**

### Introduction: Plastics and the Thermoforming Process

In this section of the course personnel will be introduced to basic thermoforming methods, types of thermoforming machines, the structure and properties of plastic including the characteristics of semi-crystalline and amorphous plastic and effects of temperature on the plastic sheet. Plastics are materials that have their own unique properties. Well-regulated control of plastic temperatures will minimize plastic degradation, shrinkage and contribute to part thickness uniformity and improve over all part quality.

**2**

**Lesson**

### Properties of Extruded Sheet

This section explains the importance of extruded sheet quality and its effects on part properties and an overview of the thermoforming process. Emphasis is on looking inside the sheet forming process to see what happens to the plastic, the internal structure of the extruded sheet and how it affects the thermoformed parts, sheet quality control of sheet thickness, MFI, internal stress, and warp.

**3**

**Lesson**

### Effective Heating of the Plastic Sheet

In the thermoforming process, the plastic is heated twice—once in the extruder and once in the thermoforming machine. This lesson covers the three main heating methods used in the thermoforming machine—conduction, convection and infrared. Control of heating in the thermoformer is key to good part quality. This section explains how plastic absorbs heat and how that affects the thermoforming process. This lesson expands on the infrared heating of the plastic sheet including emissivity, view factor, wavelength and absorption.

*Paulson's fully interactive training programs explain the relationship between machine controls, plastic behavior and the thermoforming process with full motion video, text, audio and crisp, dynamic graphic animation.*



4

**Lesson**

**Temperature Control, Vacuum and Pressure Systems**

This section describes sheet temperature control, effects of temperature variations in the surface and core of the sheet, heater temperature profiling, part thickness variations caused by the process, vacuum and pressure forming, methods to reduce part thickness variations, and measurement methods.

5

**Lesson**

**Molds—Venting, Mold Cooling and Finished Part Properties**

This lesson covers the components and design requirements for the vacuum systems including an in-depth explanation of mold cooling design and flow requirements. This lesson also teaches how sheet orientation affects part properties, and how cooling changes affect part properties; particularly part stress is explained in detail.

## PAULSON'S INTERACTIVE LEARNING SYSTEM



◆ **More Effective Training:**

Get a 40% increase in knowledge retention and comprehension using interactive technology.

◆ **Scheduling Flexibility:**

Training is available to all shifts, 24 hours a day without affecting production.

◆ **Automatic Record Keeping:**

You can test and track employee progress automatically.

◆ **No Instructor Required:**

Fully interactive format provides either a self-paced, one-on-one or classroom learning environment.

◆ **Reduced Training Costs:**

Train on company time without loss of production. No dedicated instructor, no overtime and no overhead add up to large savings.

◆ **Increased Motivation:**

Immediate feedback and personal involvement are key factors in training effectiveness.

◆ **Complete Curriculum:**

The interactive library provides a complete career path curriculum for all employees.

To sign up for a hands-on-I-T system demonstration in your plant, call **1-800-826-1901.**



3 Inspiration Lane | PO Box 366 | Chester, CT 06412  
(860) 526-3099 | E-mail: info@paulsontraining.com  
www.paulsontraining.com