



Thermoforming *Center of* Excellence

Pennsylvania
College of
Technology

PENNSTATE



Plastics **Innovation**
& **Resource** Center

www.pct.edu/pirc



Thermoforming Center of Excellence

The Thermoforming Center of Excellence at Pennsylvania College of Technology in Williamsport, PA, is an 1,800 square foot facility dedicated to research & development and education utilized by thermoformers, sheet extruders, resin suppliers, mold builders, and equipment manufacturers.

The Thermoforming Center of Excellence operates under the Plastics Innovation & Resource Center (PIRC, formerly *Plastics Manufacturing Center*) in conjunction with Pennsylvania College of Technology's Plastics & Polymer Technology academic program. The PIRC is one of the top plastics technology centers in the country with extensive material-testing laboratories, industrial-scale process equipment, excellent training facilities, and highly skilled consulting staff.

The Thermoforming Center of Excellence is able to assist with new product development, material selection, testing, and analysis; custom compounding; process improvement and development; and workforce training. Plastics professionals provide customized, on-site training programs, as well as on-campus courses. Services from qualified consultants are tailored to plastics product and process needs.

This Center is the only one of its kind in North America. Besides serving industry, the Plastics & Polymer Technology academic program is the first to offer credit courses in thermoforming as part of both the associate and the bachelors of science degree programs.

The PIRC provides technology resources to facilitate the growth and success of the plastics industry in the United States and throughout the world. The PIRC effectively combines academic, government, and industry resources to facilitate our clients' production efficiency and new product commercialization.

Potential Products Include

- Reduced material use through tooling design advancements and processing control
- Advanced theory development of mold temperature control and its effects
- Optimization of vacuum/air for faster forming, better part definition, and faster cycles
- Documentation and evaluation of the impact of recycling material properties
- Optimizing material recycling capability
- Bio materials development research

Materials Testing and Analysis

- Competitive product analysis
- Mechanical testing
- Melt flow and rheology
- Impact testing
- Failure analysis
- Quality testing
- Materials identification and deformation

Product Development

- Design services
- Product models
- Prototyping
- Mold design/construction
- Product molding trials

Technical Support Services

- Material recommendations and sourcing
- Custom compound development
- Polymer processing
- Manufacturing process recommendations
- Mold design
- Literature research



Services

Material and mold trials
Design verification trials
Composites materials development
Process development and troubleshooting
Physical and analytical testing
Consultation
National workshops
Hands-on training and seminars

Equipment

Our first state-of-the-art thermoforming machine includes the following features:

Servo-driven top and bottom platens

Capable of handling max sheet size of 36" x 48", min of 6" x 4" in ¼" increments

Sheet clamp frame capable of sheet thicknesses 0-.5" (thin and thick gauge)

Upper and lower heating ovens with multiple heating zones

Mold temperature control unit capable of heating and cooling of molds

35 ton forming press capable of up to 100psi of form pressure (36" x 48" mold)

Servo-driven, third-motion plug assist actuator (top platen only) provides for accurate plug assisting and additional platen or tooling movements





Forming Functions

The thermoforming machine is capable of performing the following forming functions under development at the Center for both rigid sheet and thin film processing:

Standard drape forming using male (positive) and female (negative) molds and combinations thereof with the use of vacuum (25 InHg), and form air pressure (50-80psi)

Plug assisted vacuum forming using third motion plug drive mechanism

Matched metal forming

Pre-billow forming – using vacuum bell/chamber

Vacuum snap-back forming

Vacuum bleed techniques

Part coining techniques

Light gauge twin-sheet forming

Control Functions

PLC and operator touch screen interface functions:

Recipe Screens – Specific tool and product forming parameters

Timing Screens – Precise control of each forming process

Heater Control Screen – Individually and precisely controlled heater elements, each with thermocouple feedback to controller

Error Screen – Showing real time e-stop, safety gates, heater and servo errors, etc.

Encoder Screen – Precisely control location and speed of platens and third-motion plus assist (platens are capable of dual speeds)

I.R. Sensor Screen – A specific temperature is used for sheet heating in place of the heating timer for improved cycle consistency

Additional Features:

- Forming sequence indicator lamps for vacuum, vacuum bleed, form air, eject air, and plug bottom position
- Additional pneumatic solenoids and timers for clamp frames, stripper bars, and mold undercut devices

Additional Equipment:

- ToolVu provides ability to monitor and maintain consistent quality throughout the thermoforming production process in real time. Benefits include up to 50% reduction of start-up scrap and up to 50% faster start-up time, consistent product quality, and data logging of production run for later retrieval. “Quality Requires Insight” and ToolVu provides a “Get a Vu” inside what is considered by some a Black Box Process.
- The Raytek® MP150 Thermal Imaging Linescanner provides real-time monitoring of sheet heating uniformity.



Equipping Students

The Thermoforming Center of Excellence is equipped with industrial-scale, state-of-the-art process equipment, world-class training facilities, and a highly skilled consulting staff. The Center is capable of demonstrating all of the possible forming techniques available in the industry today. This world-class facility ensures that Penn College graduates are exposed to the latest technology, as well as providing industry partners with access to an independent state-of-the-art development facility.



Society of Plastics Engineers Thermoforming Division Partnership

The Thermoforming Center in partnership with the SPE Thermoforming Division will conduct specific projects that benefit the industry in general. The goal of these programs is to advance manufacturing technology, support continuous improvement, and/or lower costs.

Members of the Thermoforming Center of Excellence participate in focused research and benefit from the comprehensive knowledge base available at Penn College. Plastics processors have a significant opportunity to improve their productivity and competitiveness through material and process improvements. *Example programs include:*

- Reduction of material usage through tooling design advancements and process control
- Advanced theory development of mold temperature control and its effects
- Optimization of vacuum/air to allow faster forming, better part definition, and faster cycles
- Documentation and evaluation of the impact of recycling material properties, as well as processing to optimize material recycling capability
- Research on the development of biodegradable and/or composite materials for thermoforming
- Use of independent action plug-assist techniques to gain quality and cycle advantages

The Center will present technical presentations at major conferences on behalf of the SPE Thermoforming Division and the PIRC at Penn College.

Initial start-up grants were provided by Ben Franklin Technology PARTners (BFTP) of Northeastern and Central & Northern Pennsylvania for the Thermoforming Center of Excellence.

Penn College is one of only five plastics programs in the nation accredited by the Engineering Technology Accreditation Commission of ABET.

A.A.S. – Plastics & Polymer Technology

B.S. – Plastics & Polymer Engineering Technology

Find out more about how you can develop a path for success in the plastics industry by visiting

www.pct.edu/schools/iet



PENNSYLVANIA COLLEGE OF TECHNOLOGY

Plastics Innovation & Resource Center DIF 26

One College Avenue

Williamsport, PA 17701-5799

PHONE: 570-321-5533

FAX: 570.320.5248

pirc@pct.edu

www.pct.edu/pirc

An affiliate of The Pennsylvania State University

Penn College operates on a nondiscriminatory basis.

Penn College® is registered in the U.S. Patent and Trademark Office.