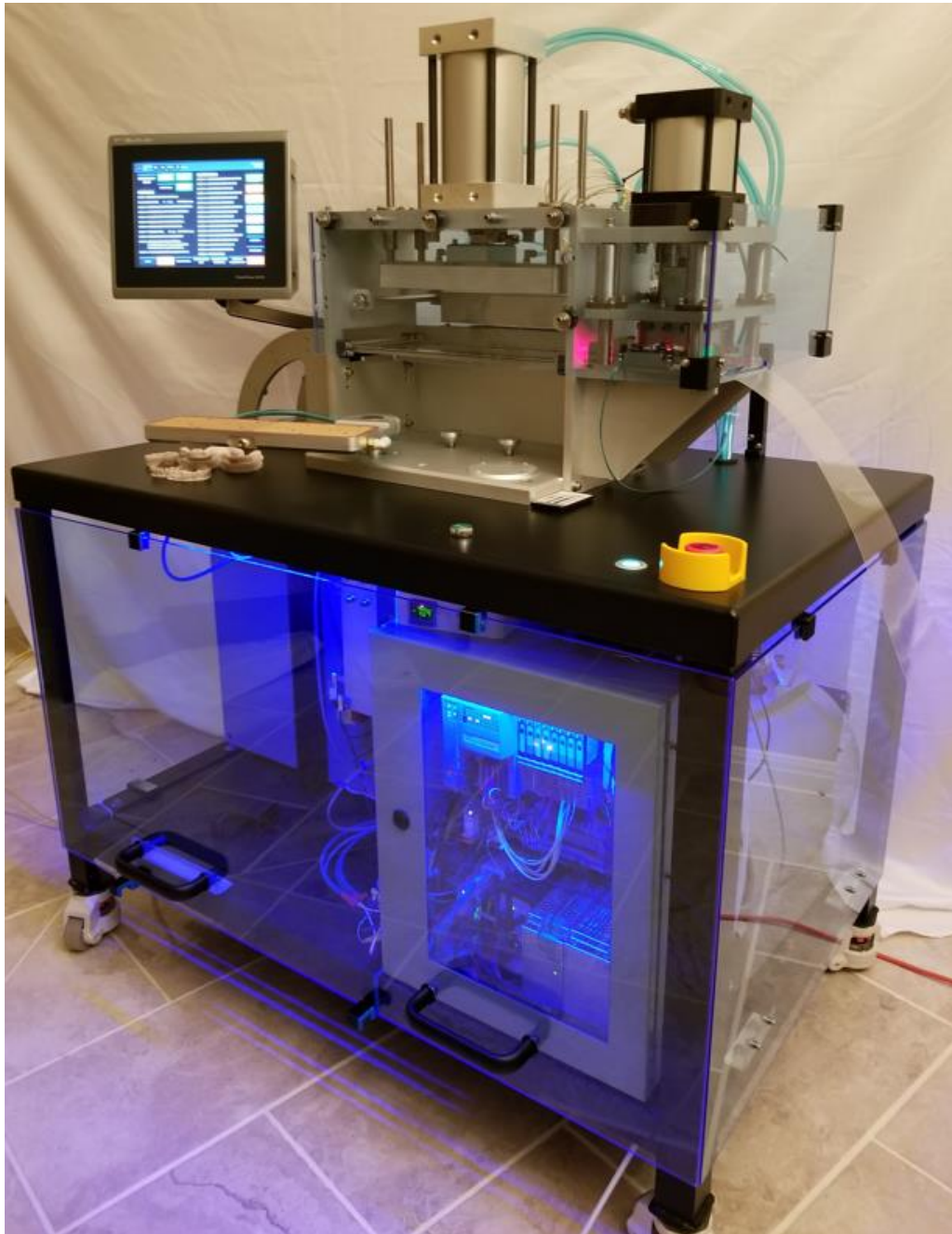


WSD 1000 Automated Thermoformer

Automated Thermoforming Tool for Dental Appliances

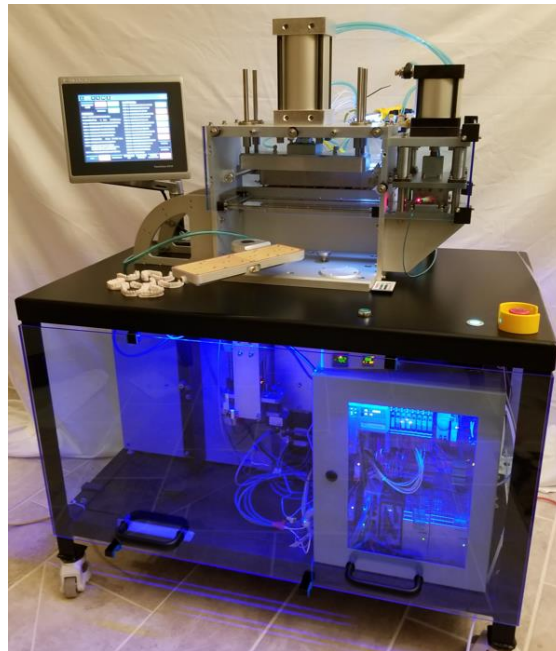


Description: WSD 1000

Semi-automated, roll-fed in-line thermoforming machine for fabricating dental appliances. This machine is specifically designed for forming thin plastic over models of dental arches by applying both positive pressure and vacuum after heating the polymer material past the softening point. A heavy welded frame houses and supports the sub-systems with clear Plexiglas skins for protection.

The critical functions of this machine are grouped in main assemblies: supply roll management, moving plastic film (String) through the machine, heating the plastic prior to forming, loading of models to be formed, performing the molding operation and cutting the molded parts from the plastic film string.

Control System – Roll Housing – Film Feed – Heater Assembly – Forming Arm(s) – Pressure Cap – Punch/Cutter



Theory of Operation

- Roll of thermoplastic film (also referred to as the String) is unwound and fed into the machine,
- Machine controlled and operated with a touchscreen display, in either Manual or Automatic mode,
- Automated sequences are PLC controlled and can be adjusted to meet process requirements,
- Machine goes through an initial system check and then enters a warm-up phase,
 - o If the plastic film has become wet while sitting idle, 10-15 feet should be sent to waste,
- Control screen announces when the machine is ready to begin automated forming cycles,
- Each forming cycle is triggered by pressing a START button (physical or software),
- This START (forming cycle) button is actuated after models are loaded on the Forming Arm,
- Heater Assembly moves over the plastic for heating to the preferred softness,
- Forming Arm rotates into the machine, directly under the film, as the Heater Assembly retracts,
- Forming Cycle has the Forming Arm and Top Cap move together sandwiching the plastic (String),
- Forming Arm and Top Cap retract away from the String after parts are formed,
- String indexes forward to the Punch/Cutter, where parts are die cut from the String,
- Parts drop below punch, into a bin or onto a ramp for collection,
- As formed parts are punched from String, excess material is chopped for easy removal to waste,
- Forming Arm rotates out for the Operator to load new models onto the arm,
- Pressing the START (forming cycle) button initiates this cycle again.

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Control System

The machine is controlled by a PLC, where the Operator interacts with the control system through a full-color touchscreen display at the front of the machine.

Control Panel:

- Manual pushbuttons for machine Start-Up, Start forming cycle and system Off/EMO,
- Touchscreen Display (Human/Machine Interface, HMI):
 - o allows Operator to control the machine, adjust settings and review system status,
 - o easy set-up and adjustment of system parameters and sequences,
 - o easy access for adjusting heater zone temperatures,
 - o remote access via network/internet, multi-level passwords.

Heating System

- Ceramic heaters move over the plastic for heating operation,
- Each heater has an embedded thermocouple,
- Each heater has independent control with programmable set-points,
- Option: of adding a bottom heater to cut heating time dramatically.

Model/Mold Loading & Forming

- Forming Arm rotates out for loading models/molds, rotates in and lifts up for forming operation,
- Top Cap moves down to meet Forming Arm at plastic film,
- Positive pressure from above, vacuum applied from below form softened plastic to mold,
- Positive pressure to Top Cap is programmable via an electronic regulator,
- Vacuum pump/system (dry scroll) is monitored via Keyence sensor and PLC,
- Top Cap and Forming Arm retract away from plastic film at completion of forming cycle,
- Model/Mold of dental arch remains captured in plastic string.
- Option: Second Forming Arm can be added to facilitate automated part loading.

Moving Plastic String through Machine

The WSD 1000 is a “roll fed” type machine, where the plastic film is moved with resistance rollers, driven by a stepper motor for maximum precision and control via absolute encoder feedback. After loading a standard roll of plastic, the film is unfurled and laced through the machine, running from the source roll to cutoff shear that chips the waste. This Film Feed drive system facilitates minimizing waste while maximizing the number of parts per foot of plastic film.

Punch/Trim Station

Air-powered punch press cuts formed parts from String,
Punched parts drop down and can be routed to a collection bin via a ramp or other means,
Punch Press cutting motion cuts off the waste from the end of the String simultaneously, eliminated the need for a waste take-up roll.

Machine Specifications

Forming Rate -----	200 dental arches/hr/Forming Arm or better
Film Utilization -----	Approximately 1700 parts/roll or better
Heater System -----	Array of Ceramic IR heaters
Forming Method -----	Air Pressure & Vacuum
Punch/Trim Press-----	Pneumatic
Air Requirements -----	1cfm @ 100 psi, 3/8 Tube
Electrical -----	21amps@240vac
Weight -----	1500 lbs.
Size -----	2.5’ Deep x 4’ Long x 5’ Tall