

Report On

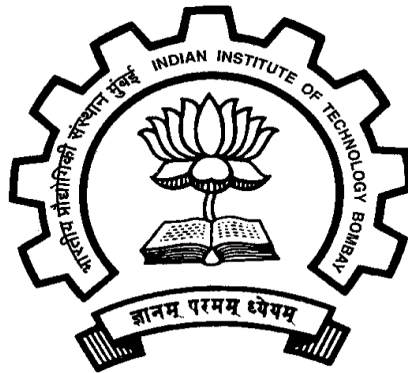
Vacuum Forming Machine

Presented by

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Indian Institute of Technology, Bombay

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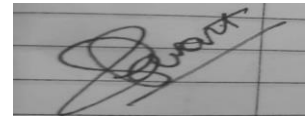
Declaration

We hereby declare that this report titled Vacuum Forming Machine is carried out as report for one day training on Vacuum Forming Machine in ELL in Indian Institute of Technology, Bombay, except to the extent that assistances from other sources are duly acknowledged. All sources used for this course report have been fully and properly cited. It contains no material which to a substantial extent has been submitted for the award of any degree/diploma in any institute or has been published in any form, except where due acknowledgement is made.

Date: 21.03.2022

Name and signature

1. Sadanand Sawant

A black and white photograph of a handwritten signature in dark ink on a grid background. The signature is stylized and appears to read 'Sadanand Sawant'.

2. Arkadeep Barua

A handwritten signature in dark ink that reads 'Arkadeep Barua'.

3. Poulami Mandal

A handwritten signature in blue ink that reads 'Poulami Mandal'.

Introduction

Vacuum forming is a simplified version of thermoforming, where a sheet of plastic is heated to a forming temperature, stretched onto a single-surface mold, and forced against the mold by a vacuum. This process can be used to form plastic into permanent objects such as turnpike signs and protective covers.

Design & Specification

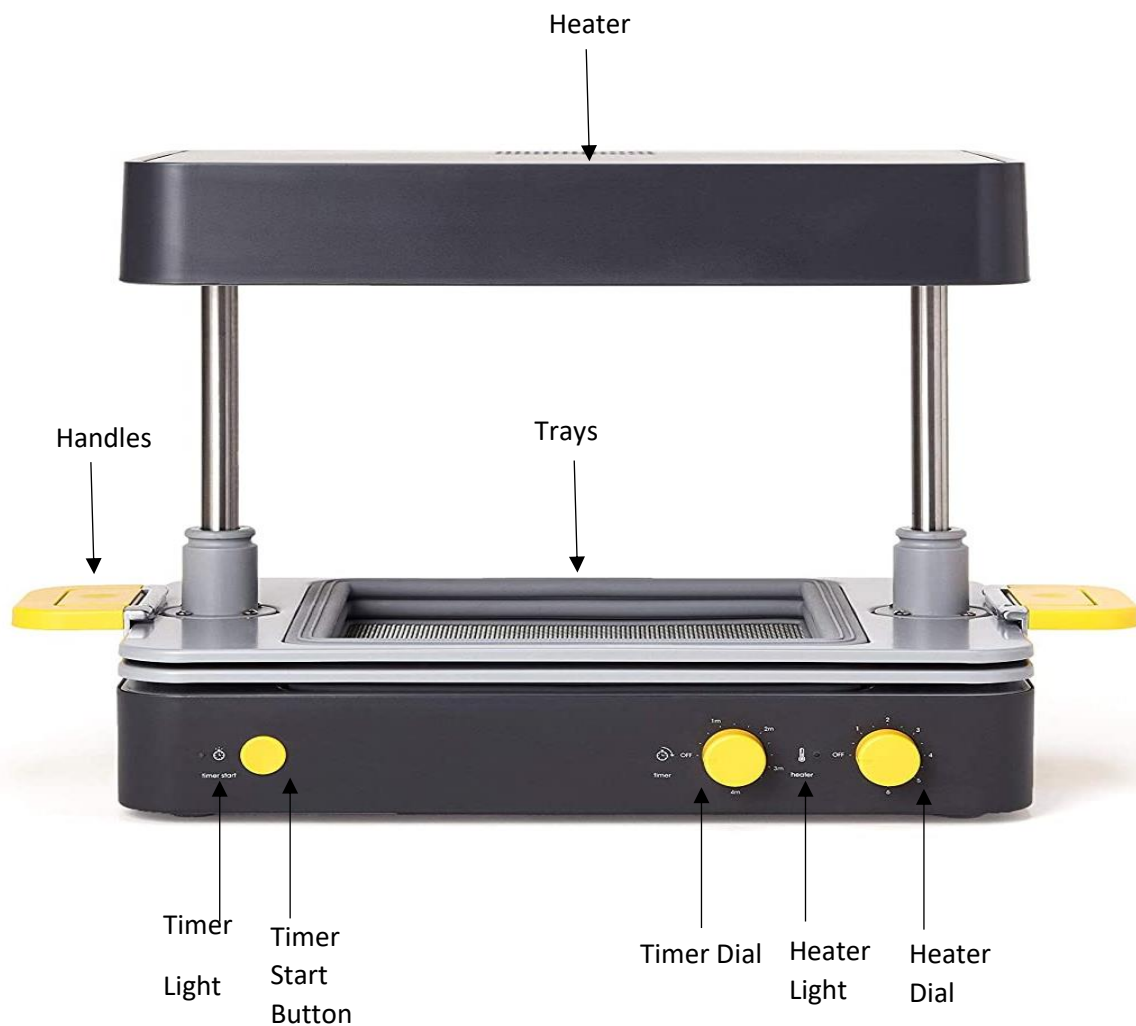


Figure 1 Front view of the Vacuum Forming Machine

Design Details

Adapter

A universal adaptor that enables the Mayku Form Box to work with any vacuum cleaner.

Handles

A tray clicks and handles design, with cast aluminium hinges, in one single mechanism.

Using Form Box is as easy as possible.

Bed

A super-fine mesh to increase airflow to the 3D shape, placed on the bed with a soft silicone edge.

Trays

ABEC 5 bearings for smooth operation. Silicone seals to create a perfect seal. Pressed steel for extra strength.

Specification

Brand	Mayku LTD
Type of Machine	Vacuum Forming
Manufacturer	MAYKU
Model	FBA180123UK
Model Name	Mayku FormBox
Height	315mm
Length (Including handle)	466mm
Width	274mm
Forming Bed	200mm x 200mm

Item model number	1831004519
Voltage Rating	220-240 Volts
Current	5A
Wattage	1000 Watts
Power Source	Corded Electric
Batteries Included	No
Batteries Required	No
Material	Ceramic
Has Auto Focus	No
Programmable Buttons	No
Manufacturer	MAYKU
Country of Origin	China
Item Weight	13kgs

Calibration

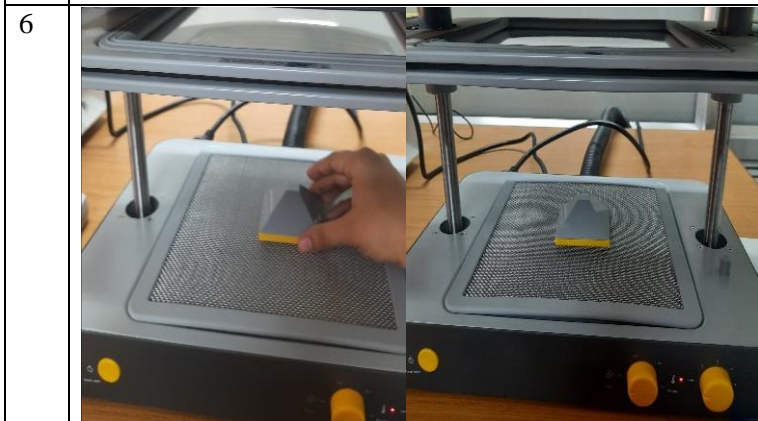
1. First plug the form box into the main and switch it on. Plug the vacuum cleaner's power cable into the back of the FormBox and turn the red switch of the vacuum cleaner to point 1. Insert the smaller end of the FormBox vacuum tube into the port of the back of the FormBox. Make sure it is pushed in all the way and the vacuum cleaner's hose is connected to the other end of the vacuum tube.

Operation Procedure

Sl No	Photos	Procedure
1		<p>First, plug the FormBox into the mains using the power cable already attached to the back of the machine. Plug in the Vacuum cleaner's power cable into the back of FormBox and switch-on of the machine.</p>
2		<p>Make sure that the vacuum cleaner hose is connected to the FormBox vacuum tube. Switch on the vacuum. Turn the Red switch on by rotating it clockwise to point 1. The vacuum cleaner draws power directly from the FormBox. Do not plug the vacuum cleaner into the wall.</p>
3		<p>Unclamp the tray handles by lifting the outer ring of each handle. Lift the top tray up until it clicks into place near the heater.</p>
4		<p>Now, peel the protecting layer of the sheet and place the sheet properly on the lower tray with proper alignment.</p>



5 Next, pull up the lower tray along with the sheet to clamp with the upper tray. This will hold the sheet securely between the trays. Make sure that both sides are clamped. Now both trays are placed near the heater.



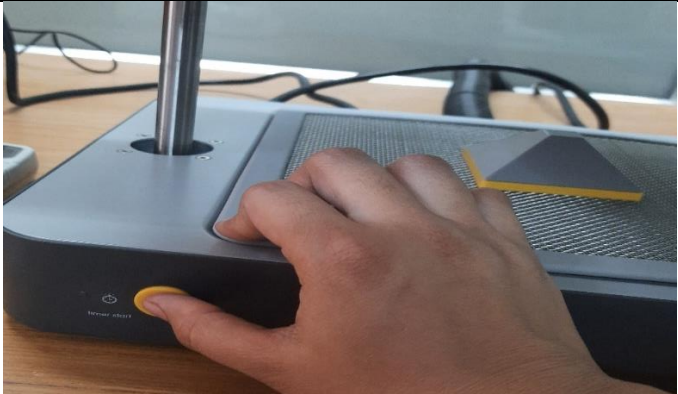

6 Now place the object on the beads. Make sure the object is placed centre of the bead

Precaution: Be careful not to include any undercuts when designing the templates. Undercuts prevent to remove template from forms.

Cast Sheet Instructions

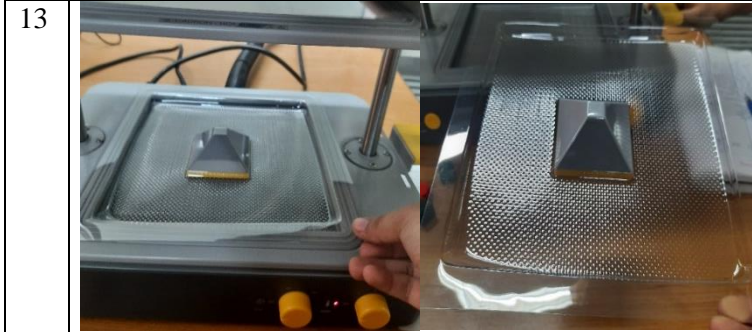
Form Sheet Instruction

7 Sheet materials have different temperatures and time ranges. Set the timer and temperature according to the instructions given on the sheet. Consider the environmental conditions like pressure, and temperature of the room also.

8		<p>Hit the timer button. The heater will start heating. The light will flash orange as it heats up and go green when it's at the correct temperature.</p>
9		<p>As the timer is approaching the end, it will start beeping faster.</p>
10		<p>Now look for the bubbles that are formed in the sheet you used. If the bubbles are coming and the sheet is ready to form, then push both the trays downwards by giving a jerk. Both the trays will hit the vacuum button and turn it on.</p>
11		<p>Now as the vacuum cleaner is automatically turned on, it will suck all the air out from around the shape.</p>



12 Keep the trays as it is for 5-6seconds while the vacuum cleaner is on.



13 Then unclamp the upper tray and remove the both sheet and the model. Clamp the lower tray with the upper tray. Now the form is ready.



14 Set the both timer and temperature button off.



15 Keep the machine turn on for 15-20 minutes after the use.

Compatible sheet materials (0.25-1.5mm): PETg; HIPS; PLA; Polypropylene; Polycarbonate; Polystyrene; PVC; Kydex; HDPE; LDP; EVA foam; TPU; ABS; Extruded Acrylic

Compatible template materials: Most 3D printer materials; Wood; Milled and injection moulded plastics such as ABS or nylon; Steel; Aluminium; Plaster; Resins; Hardened clays; Silicone; Paper and card; Toughened glass; Wet clay and cooking oil also work well for preventing overcuts.

Mute:

If you would like to turn off the FormBox sounds, turn on the heater to any setting then press and hold the timer start button for 7 seconds. Repeat to turn them back on.

Vacuum shut Off:

To turn the vacuum off in the middle of the suction, press the timer start button to cut the power to the vacuum cleaner.

Precautions

1. **Space:** Ensure that the templates are as close to the center of the vacuum plate as possible.
2. **Don't touch the heater coils when the heater is on.**
3. **Don't push the trays downwards until bubbles are forming.**
4. **Packing:** While placing multiple objects on the plate, ensure that you leave at least a 3cm gap between them. Leave more space for taller and larger objects.
5. **Height/Width Ratio:** Templates should be wider than they are tall. This will help to avoid thinning at the top of the form.
6. **Avoid webbing:** Avoid sharp angles less than 90°. This can cause webbing as the sheet material can bunch and fold onto itself.
7. **Compatible Materials for Forming:** The Mayku FormBox works best with thickness thermoplastic sheets of 0.25 - 1.5mm.
8. **Maintenance:** Aside from cleaning the forming tray from time to time, the machine is remarkably resilient and requires little upkeep.

Conclusion

The FormBox is fast to set up and easy to use. After completion of the training on Vacuum Forming machines, we have learned how to form vacuum objects easily at our lab. These objects can be used to package any device, prototyping, or create short runs of professional products.

Useful Links

1. https://cdn.shopify.com/s/files/1/1373/5663/files/5af4948f21f3e0e642f9cc6a_Forming_mask_white-transcode.mp4?10175
2. https://cdn.shopify.com/s/files/1/1373/5663/files/5af4948f21f3e0e642f9cc6a_Forming_mask_white-transcode.mp4?10175
3. <https://youtu.be/hTot7MfNcKw>
4. <https://www.mayku.me/pages/industrial-designers-guide>
5. <https://www.mayku.me/pages/industrial-designers-guide>