

Soap Packaging Mechanism (Production Line)

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SCOPE

To design, fabricate and test a semi-automatic soap packaging mechanism to improve the manufacturing process of the packaging production line.

GOAL

To reduce the overall soap packaging production time and its associated manual labour.

OBJECTIVES

- Package a bar of soap in under 2.5 minutes.
- Remain within a footprint of 60 cm X 100 cm.
- Do not exceed a weight limit of 50 lbs.

RESULTS SUMMARY

- 75.4% production increase (w.r.t. client)
- \$4,526 annual savings (w.r.t. client)



CURRENT PACKAGING PRACTICES

- Manually hand package soap bars independently
- Soap bar packaging is produced in sets of 70 bars
- Roughly 12,000 soap bars packaged annually
- Tedious, time consuming and labour intensive

Current Packaging Numbers.

Number of Soap Bars	Packaging Time (min)	Labour Costs
1	2.5	\$0.5
70	175 (~3.0 hrs)	~\$36.0
12,000	30,000 (500 hrs)	\$6,000

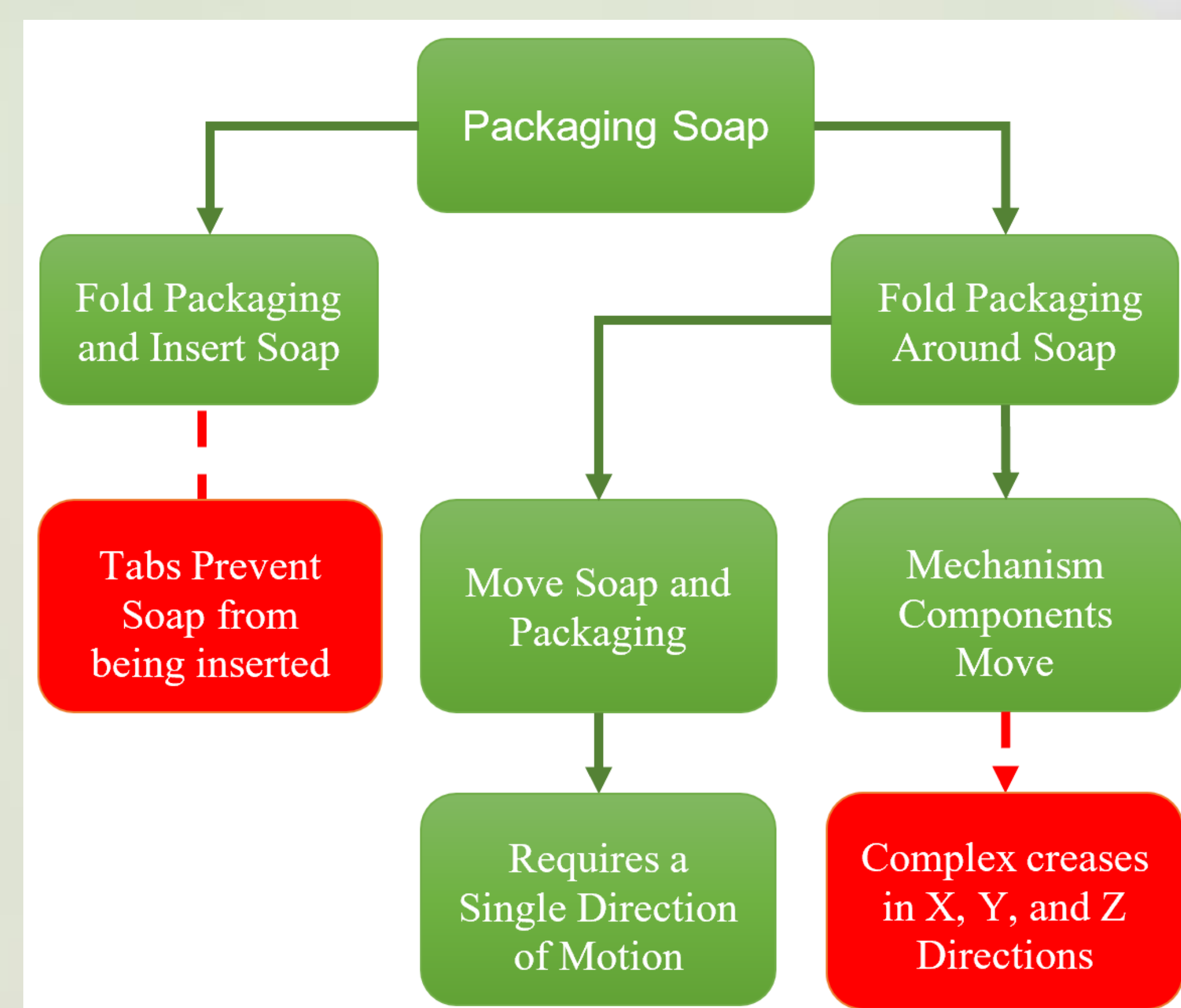
*Minimum wage worker - \$12.00/hr

FOLDING PROCESS

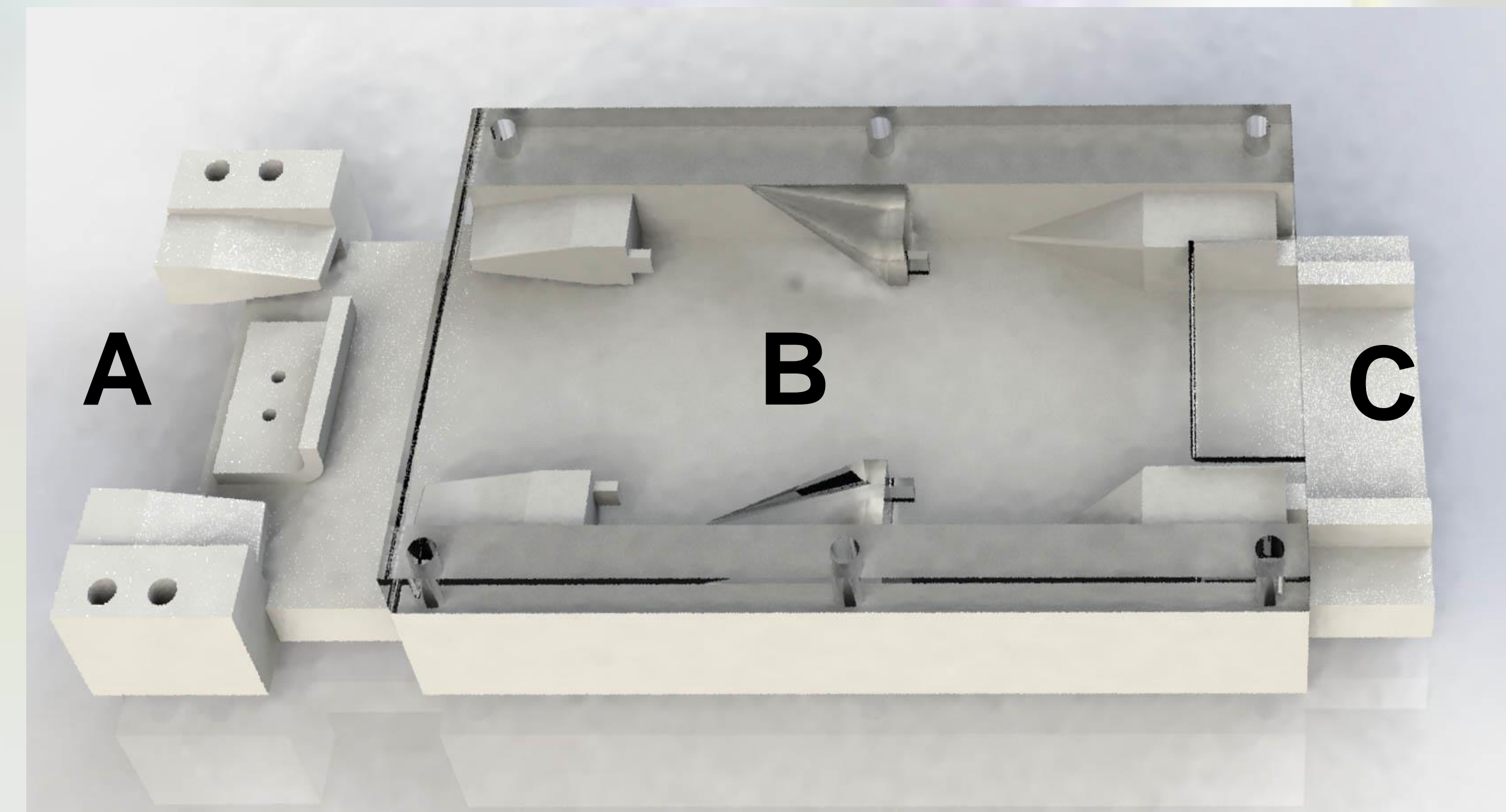
- Order of folding process during soap packaging
- All tabs must be pre-folded before packaging



DESIGN FLOWCHART



KEY DESIGN FEATURES



Functionality

- A) Gearbox Assembly (Start)**
- Inserting soap produces Fold 1
 - 3 servo motors system; Motor 1 produces Folds 2 and 3. Motors 2 & 3 work in synchronization, producing Folds 4 and 5, directing soap and package into Part B.
- B) Bridge Folding Mechanism**
- No moving parts
 - Angled walls produce Folds 6 & 7.
 - Subsequent soap bars push one another through Part B.
- C) Soap Holder (End)**
- 1/2" walls hold product for adhesive application
 - Design allows user to apply adhesive to 4 soap packages at once.

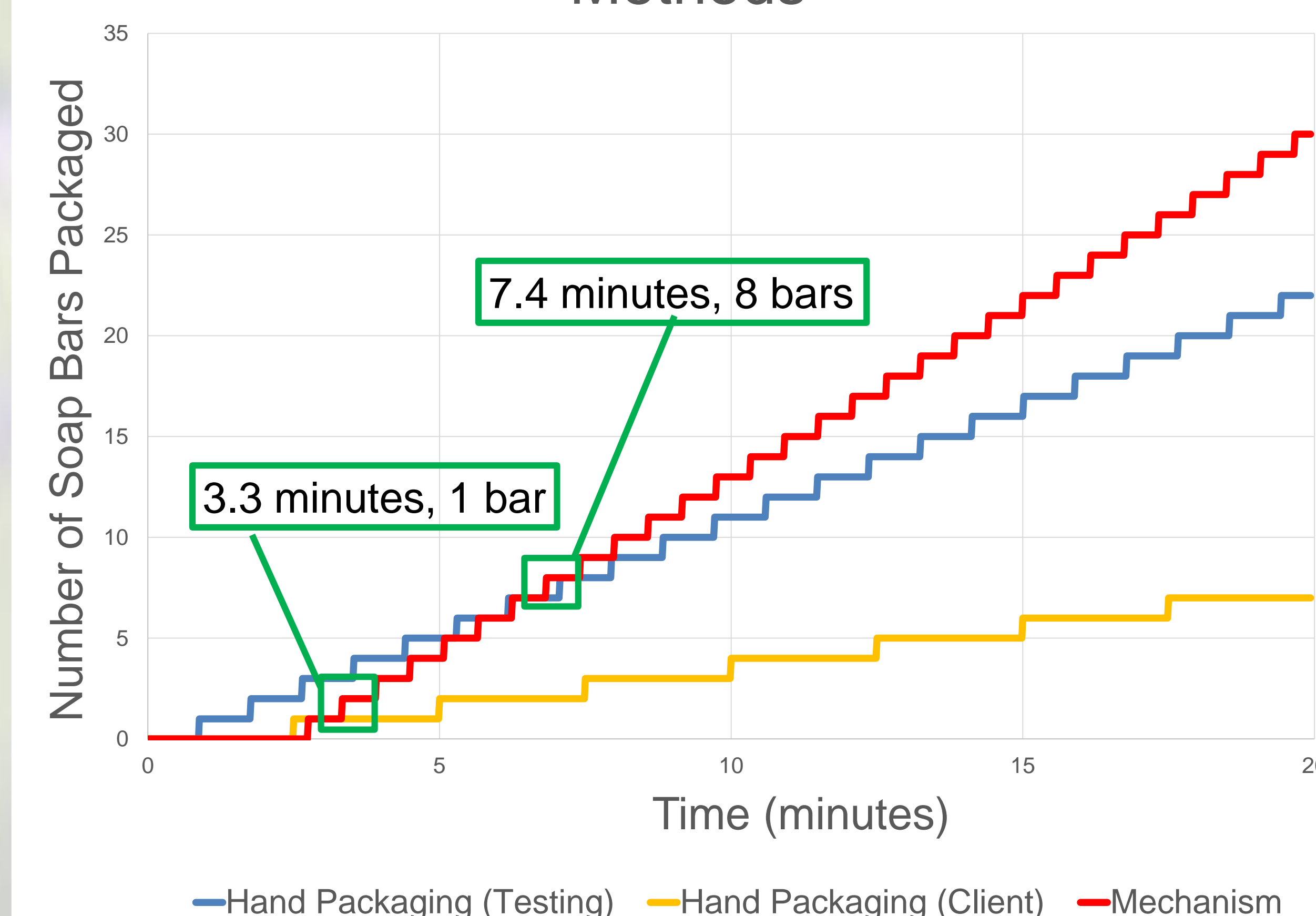
Engineering Justification

- Modular Design**
 - Ease of assembly/disassembly. Allows user to clean required parts as necessary (after sets of 70 bars)
- UHMW Plastic**
 - Light weight, portable
 - Structurally durable with low friction, allowing ease of continuous flow

RESULTS

Packaging Method	1 Package	70 Packages	Mechanism Production Increase	Annual Production Costs
Client	150 s	175.0 mins	75.4%	\$6,000
Testing	53 s	61.8 mins	30.4%	\$2,120
Mechanism	35 s	43.0 mins	NA	\$1,474

Comparison of Soap Packaging Methods



DISCUSSION

- Mechanism requires 165 seconds to produce the first packaged soap.
- Subsequent packages are produced in 35 second intervals.
- Design reduces production bottleneck and associated manual labour via semi-automated packaging production line.
- Viable packaging process for all users/ages with corresponding safety features including E-stop and 2-button push start, removing pinch point hazard.

REFERENCES

<https://www.genigraphics.com/templates>
<https://lavendercanada.com/>