



HI !

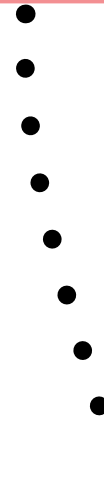
Hi again!



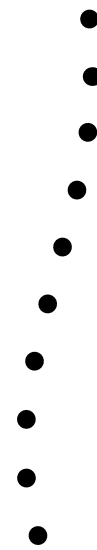
- Joost
- 24
- Industrial Design master student at TU Delft
- Graduation on the Arbor Press!

Let's talk about..

RESEARCH FINDINGS

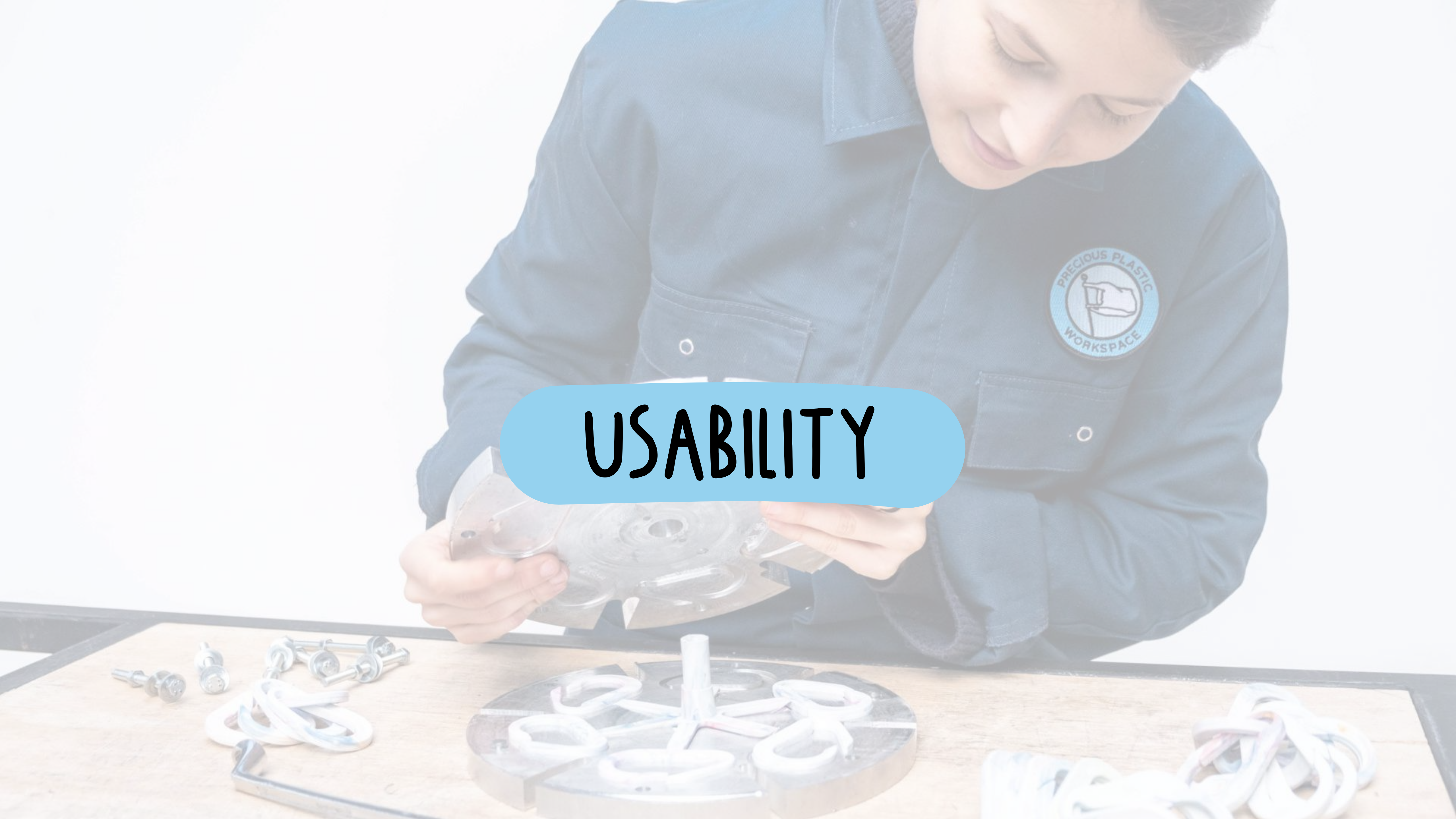


BEST PRACTICES



DESIGN DIRECTION

USABILITY



Usability evaluation

- 2 observations
- Interviews with 7 lever-press owners

Usability problems



Applying force is very inconvenient



Screwing on the hot mold can cause burns



The nozzle is often either under- or overheated, leading to clogs and leaks



Exposed band-heaters burn plastic flakes

Usability problems

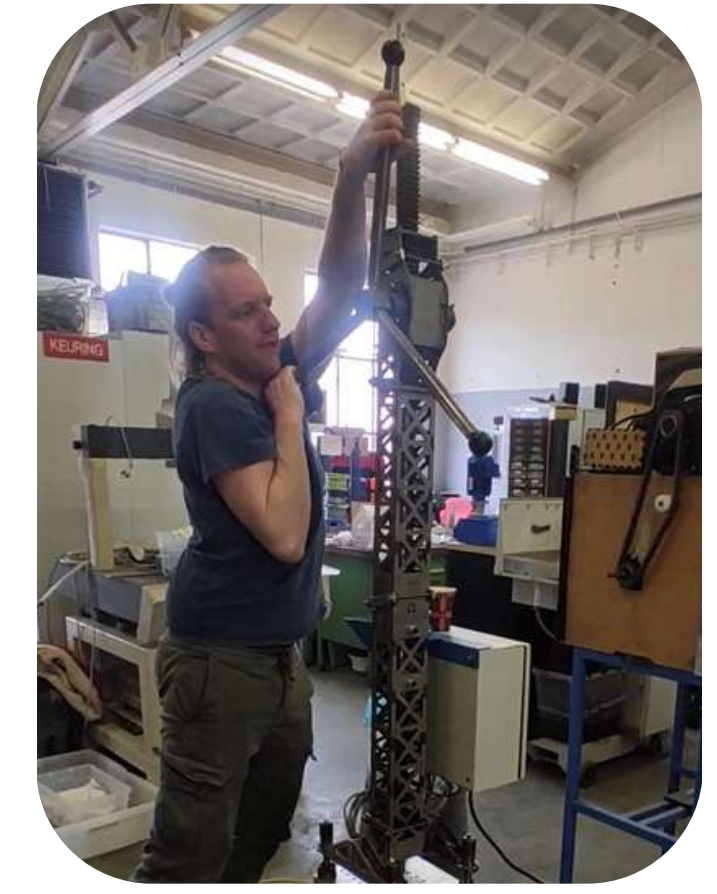
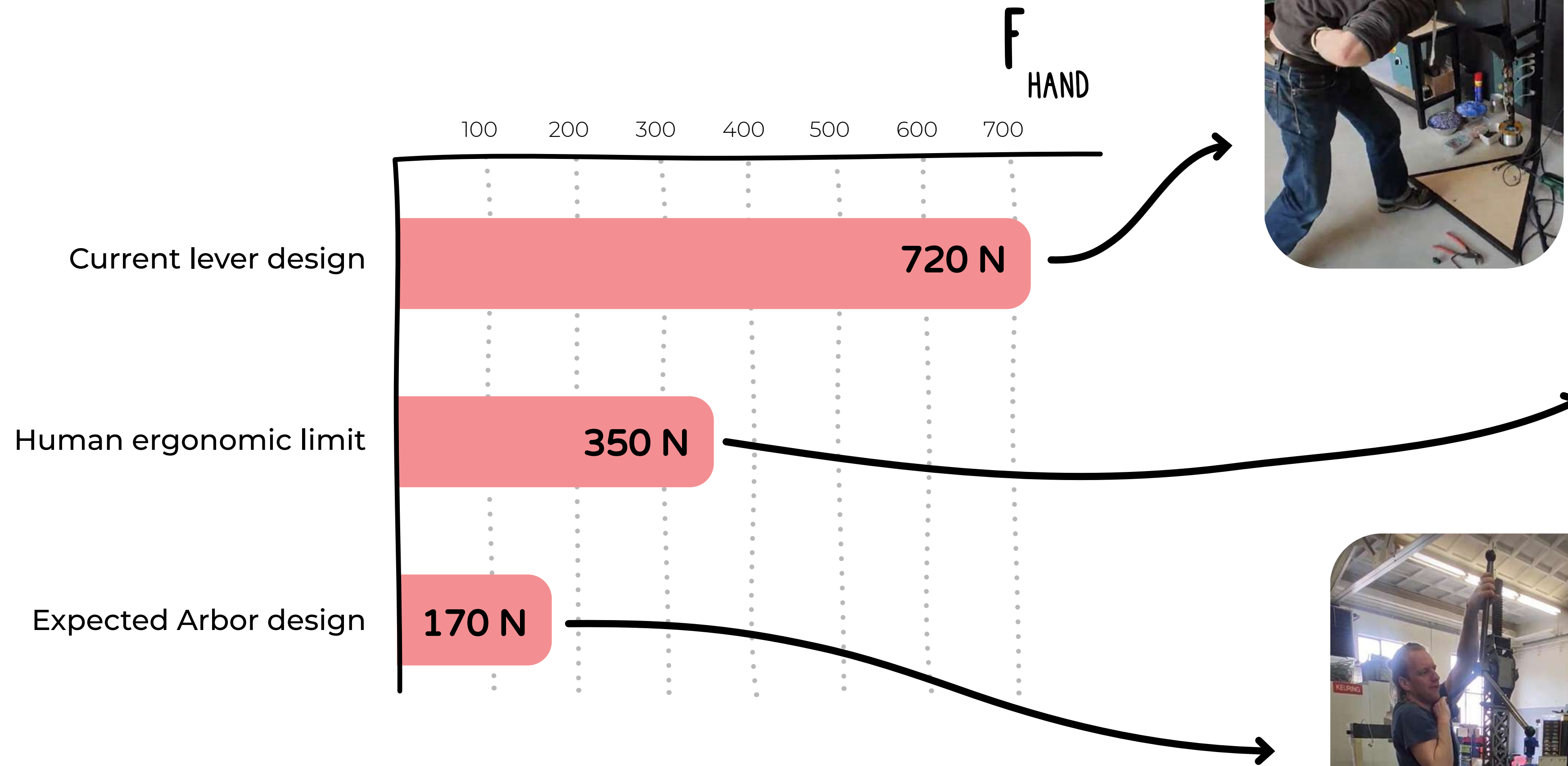
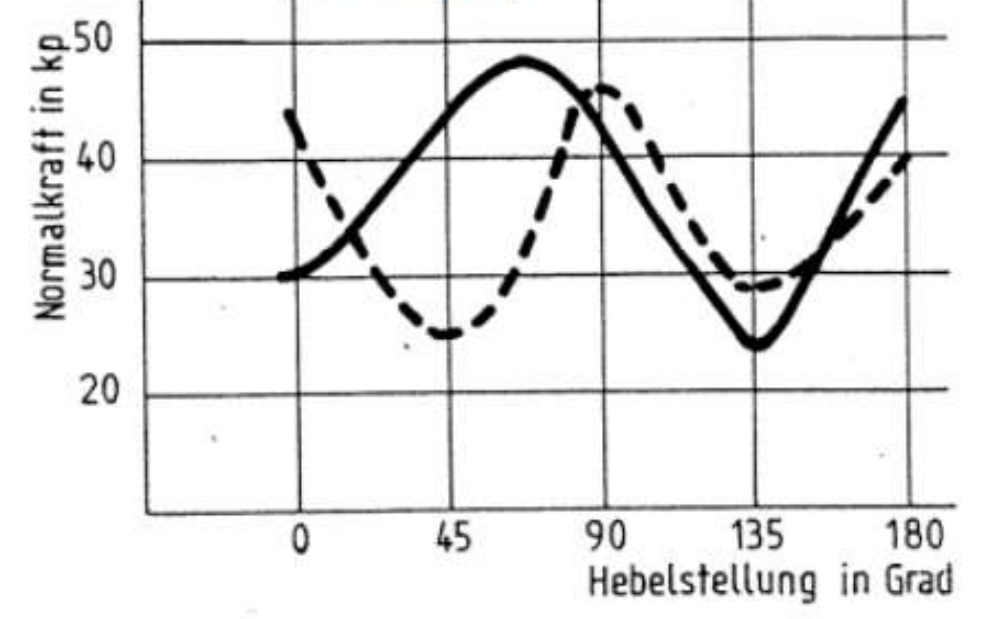


Bild 56.3: Normalkraft F_N des rechten Armes beim Betätigen eines Hebels oder einer Kurbel in vertikal-sagittaler Bewegungsbahn vor dem Oberkörper (Siemens AG).





BUILDABILITY

Buildability survey

- 21 respondents across the world
- Accessibility of resources and manufacturing techniques
- Both Arbor and Lever-style



Main buildability results



Fitting injection parts together is hard




Welding is doable for most, but bolting is much more accessible



Insulation is not standard, but many people make it in one way or another



Welding the barrel leads to warpage

The background of the image is a repeating pattern of colorful paper clips. The clips are in various colors including blue, yellow, pink, orange, and light green, and are arranged in a grid-like fashion across the entire frame. In the center of the image, there is a yellow rounded rectangular box containing the text "USE-CASES".

USE-CASES

Buildability survey

- Based on all interviews and observations
- Different goals with injection machine

SEMI-INDUSTRIAL

EDUCATION





THE SEMI-INDUSTRIAL RECYCLER

Recycling as much plastic as possible by making and selling high quality products



High Quality



Fast



A lot of products

Preferences & Resources



High level of automation



Thorough cleanability



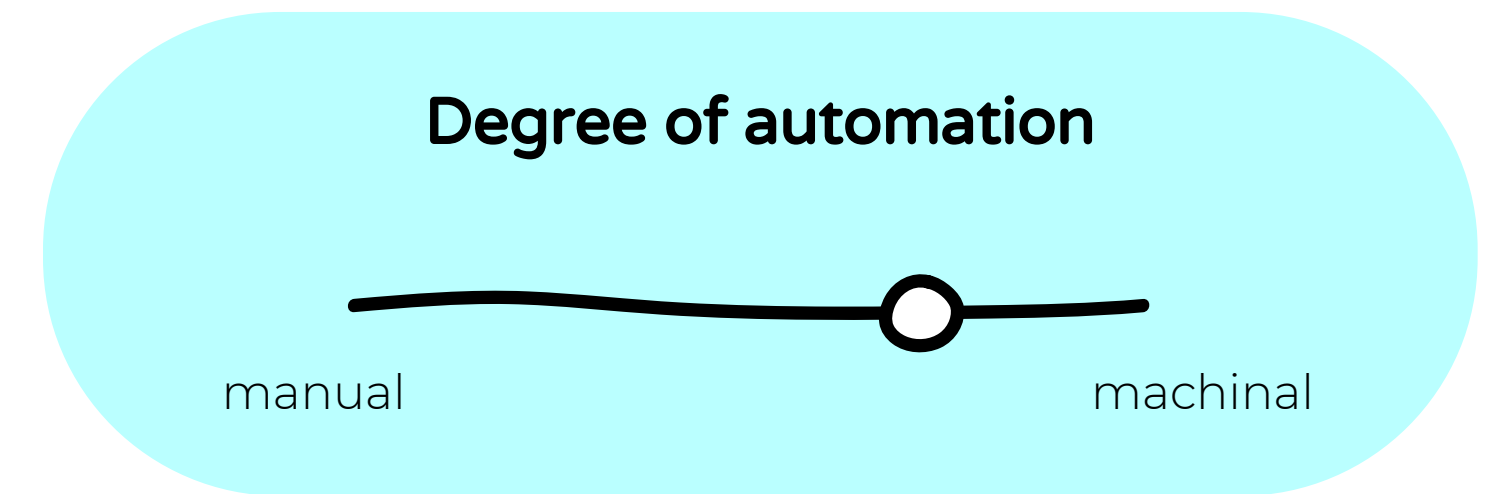
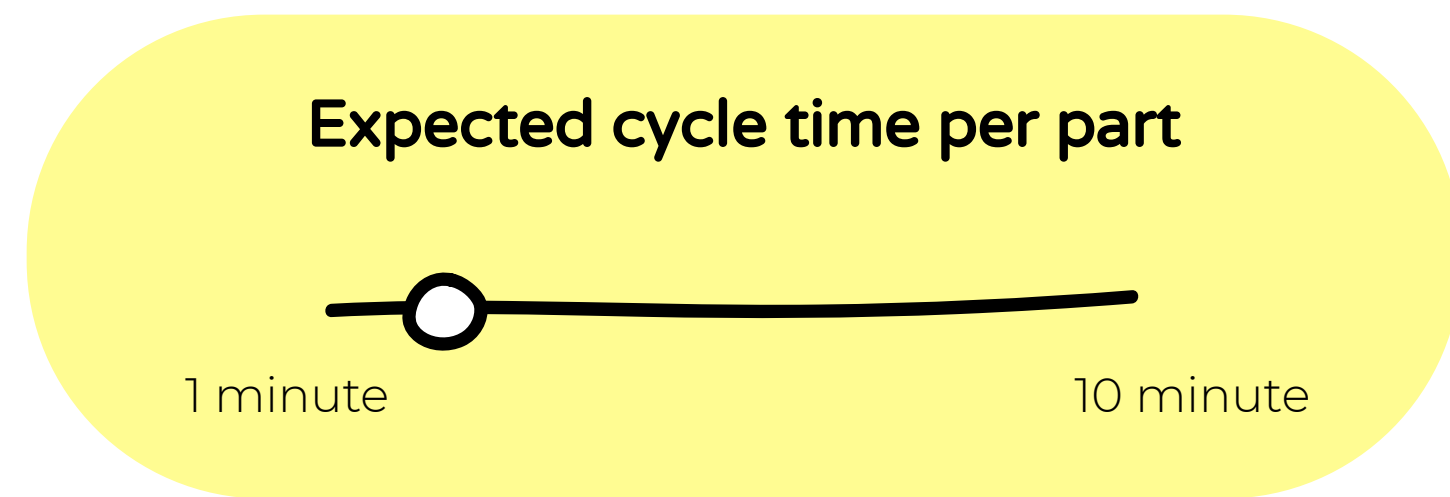
Quick and secure mold clamping



Advanced, near industrial injection machine



Overview



Based on interviews with: (thanks a lot!)



Peter-Bas Schelling



Debrah Nijdam



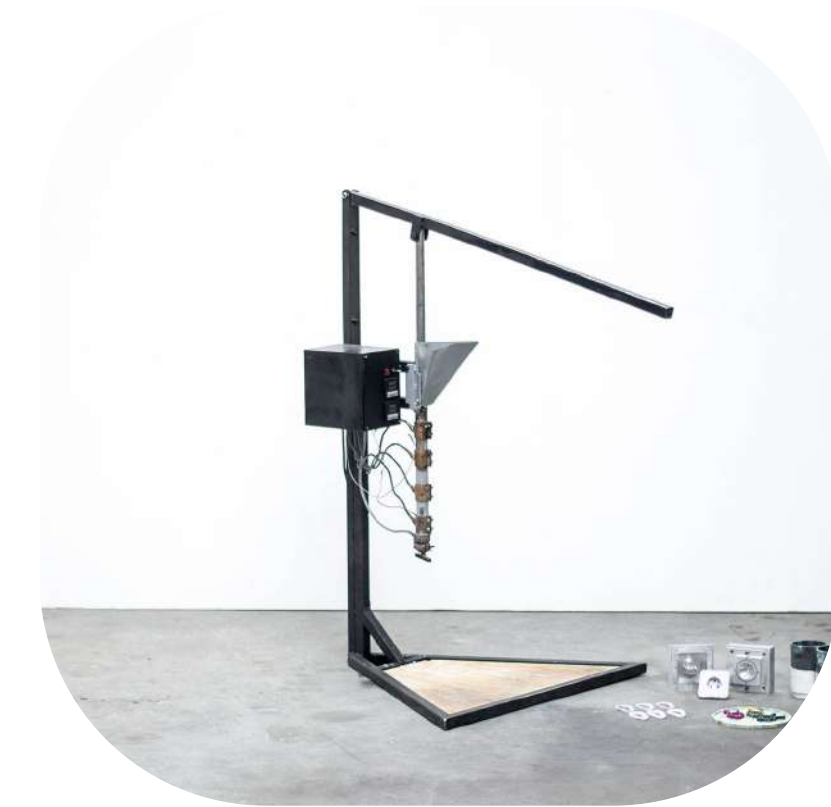
Mitchell Lammering



THE EDUCATOR

Practically teaching people
about plastic recycling

Main goals



Low-Cost

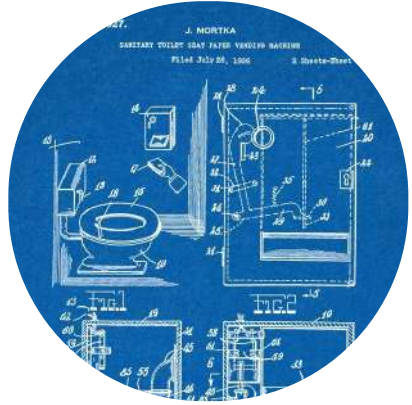


Show the process



Teach about recycling

Preferences & Resources



Buildable with basic tools



Transportable by one person



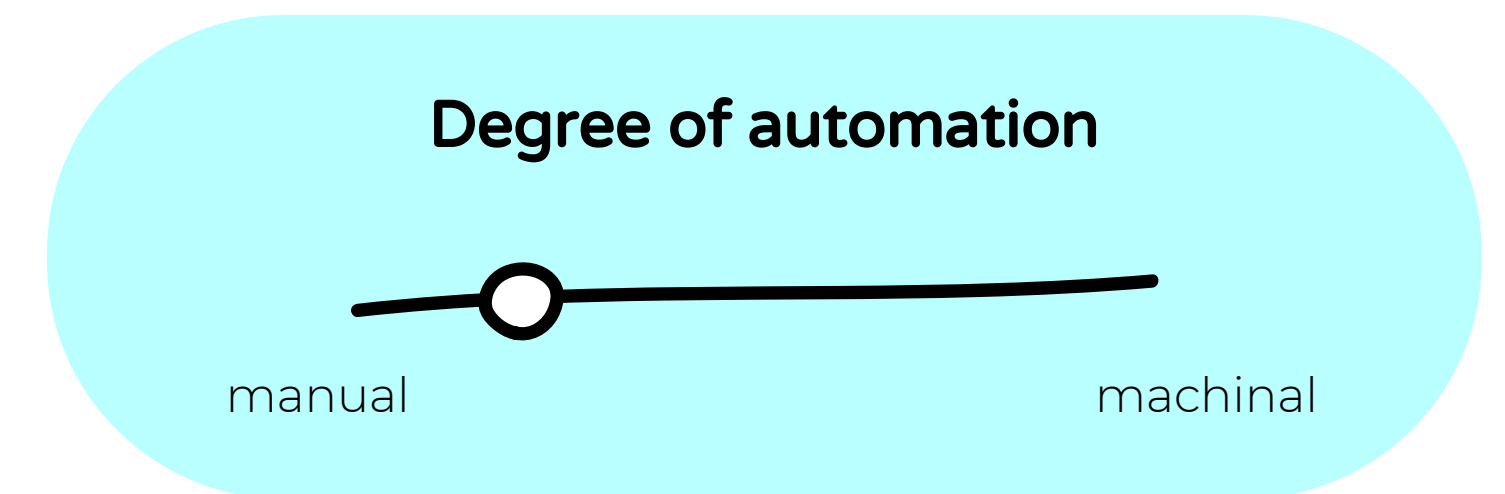
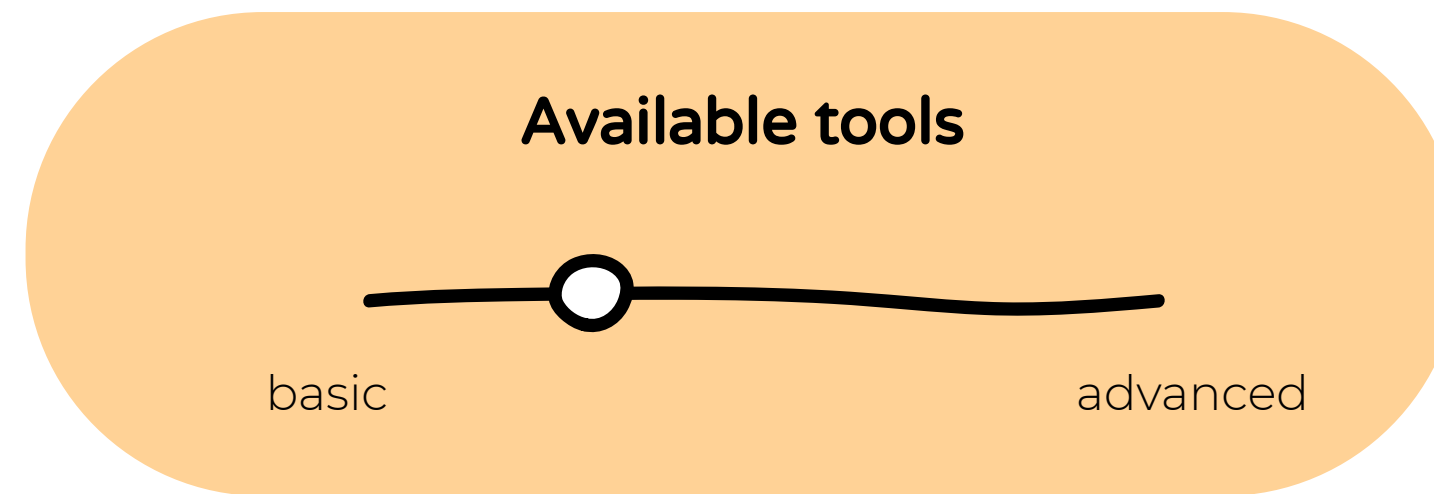
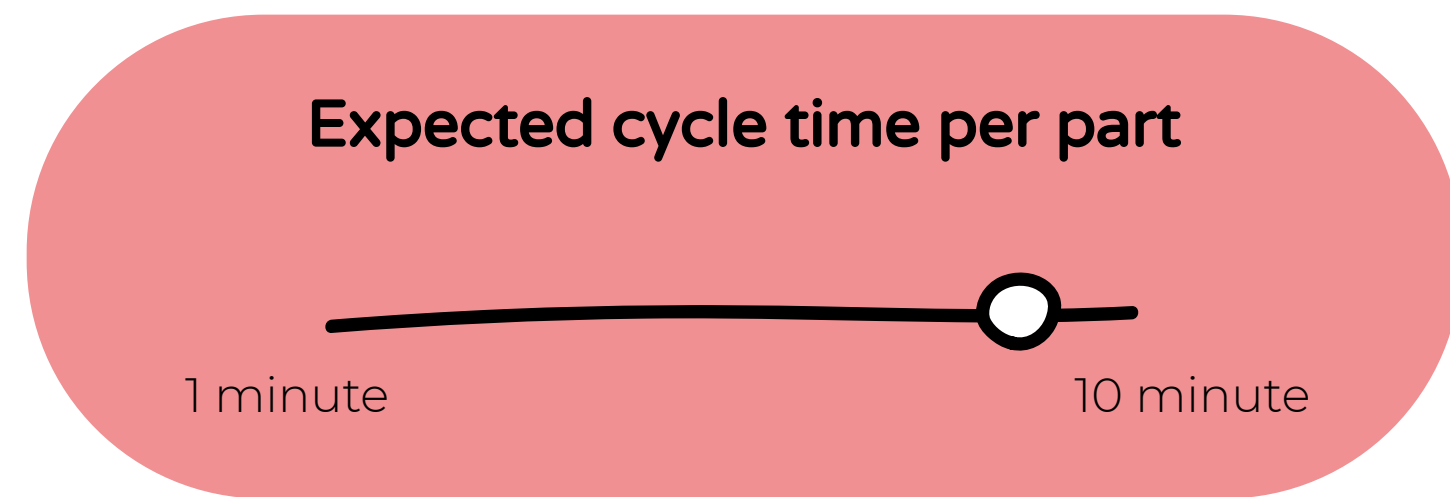
Safe for all, children included



Clean-cut building plans



Overview



Based on interviews with: (thanks a lot!)



Teun Zoetemeijer



Ramdhan Abu Azzam



Suleiman Ali Mohammed

Scope of OS injection builders



SEMI-INDUSTRIAL TOOL



EDUCATION TOOL

(almost) All potential injection builders
are in between here!

Scope of OS injection builders



SEMI-INDUSTRIAL TOOL



EDUCATION TOOL

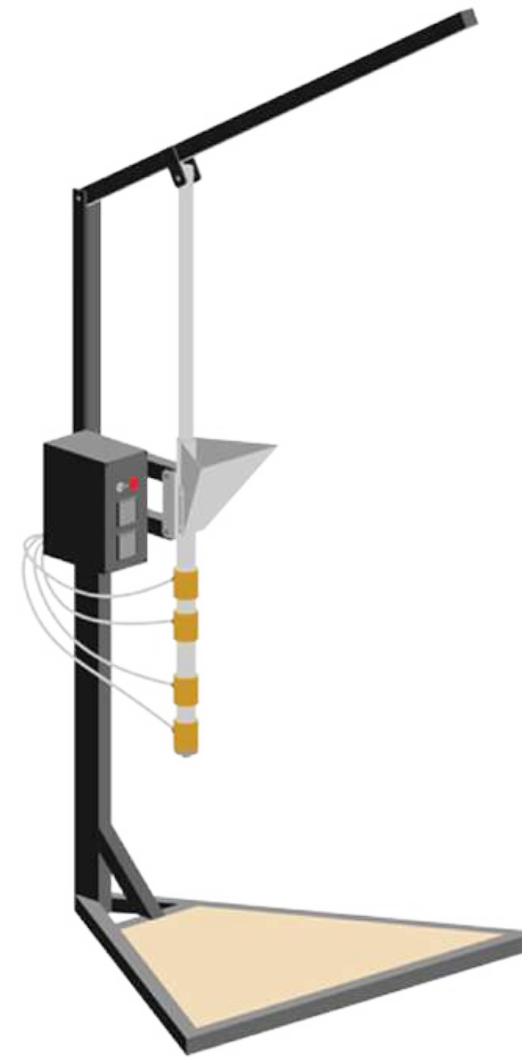
COMMERCIAL MACHINE BUILDERS

BUY-ONLY USERS

Current injection builders



SEMI-INDUSTRIAL TOOL



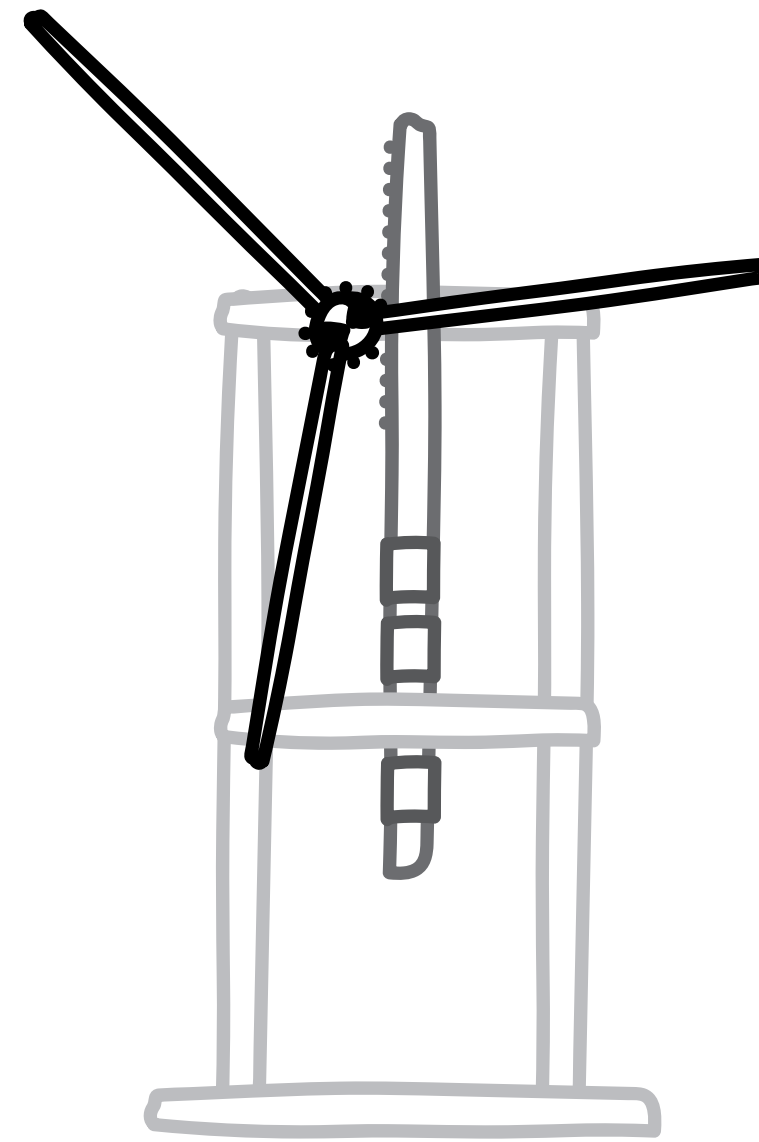
EDUCATION TOOL



Which use-case for the Arbor-press?



SEMI-INDUSTRIAL TOOL



?



EDUCATION TOOL

- 'Pro' build (CnC'ing, lasercutting)
- Higher cost (500€)
- Short cycle time (2-4 mins)

- Simple to build (Basic tools)
- Lower cost (200€)
- Longer cycle time (5-10 mins)



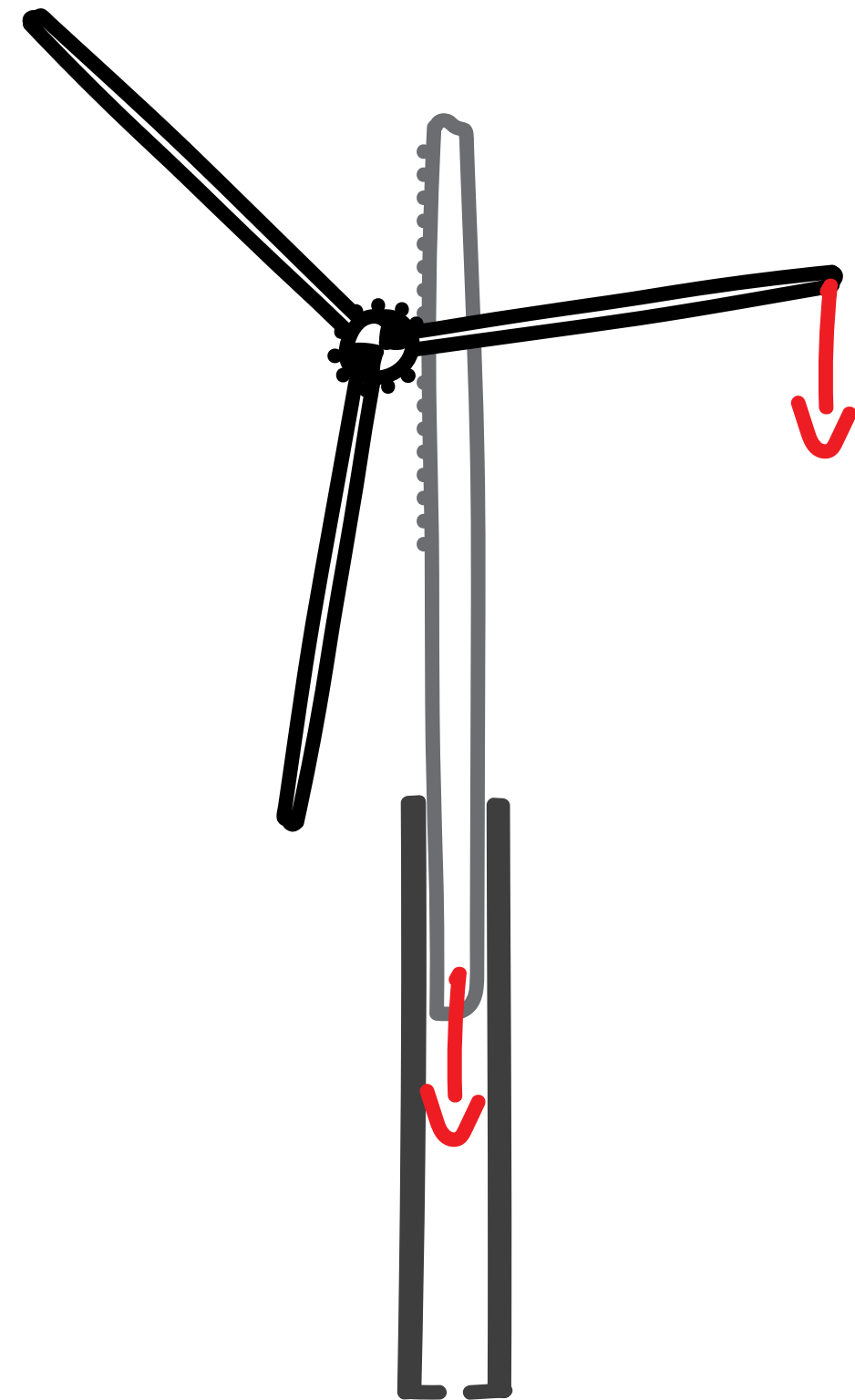
BEST DESIGN PRACTICES

Best practices

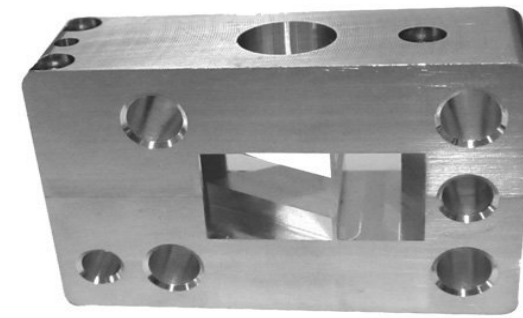
- As discussed in the Discord Channel (thanks a lot!)
- Divided among main sub-assemblies
- Solutions ranging from basic to advanced

Arbor mechanism

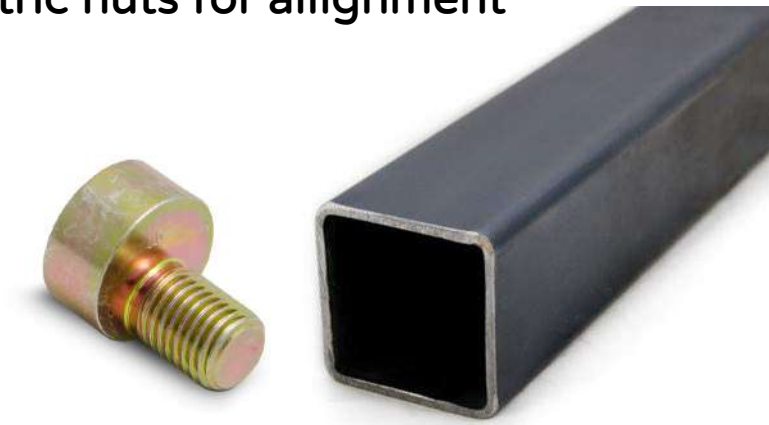
- Human force of around 350N
- Should minimally produce ± 2300 N on melt



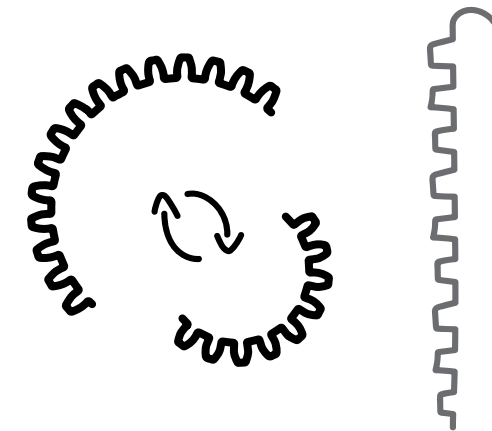
CnC'd separate gearbox



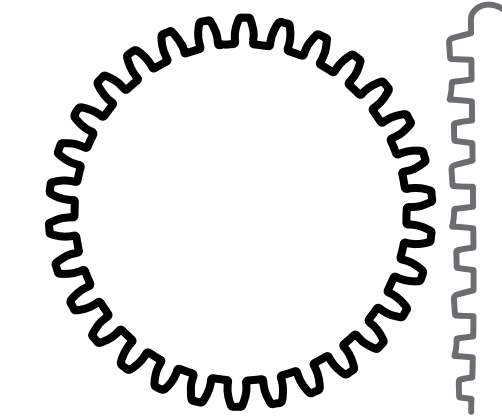
Gearbox integrated in frame, excentric nuts for alignment



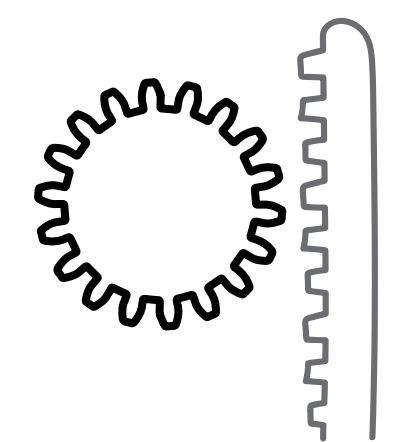
Multiple gears, ability to switch use-cases



Single gear for small, thin-walled products



Single gear for large, thick-walled products



Round rack (functions as plunger)



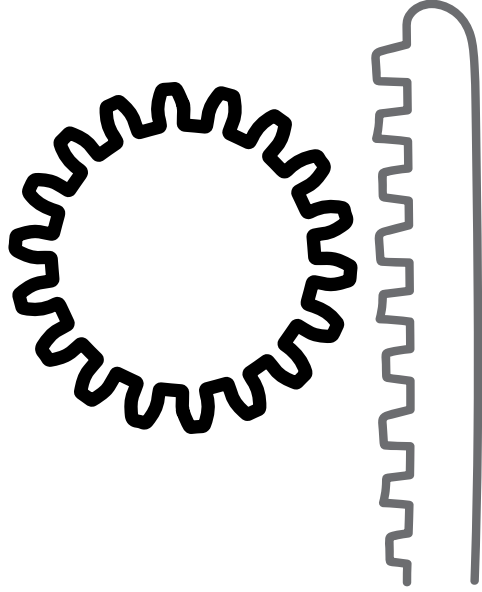

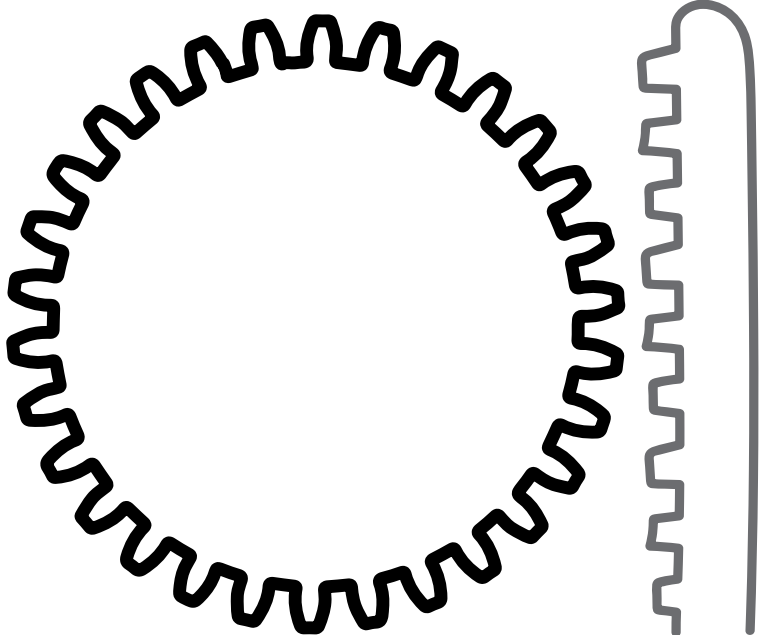

Square rack (separate plunger)



INDUSTRIAL TOOL

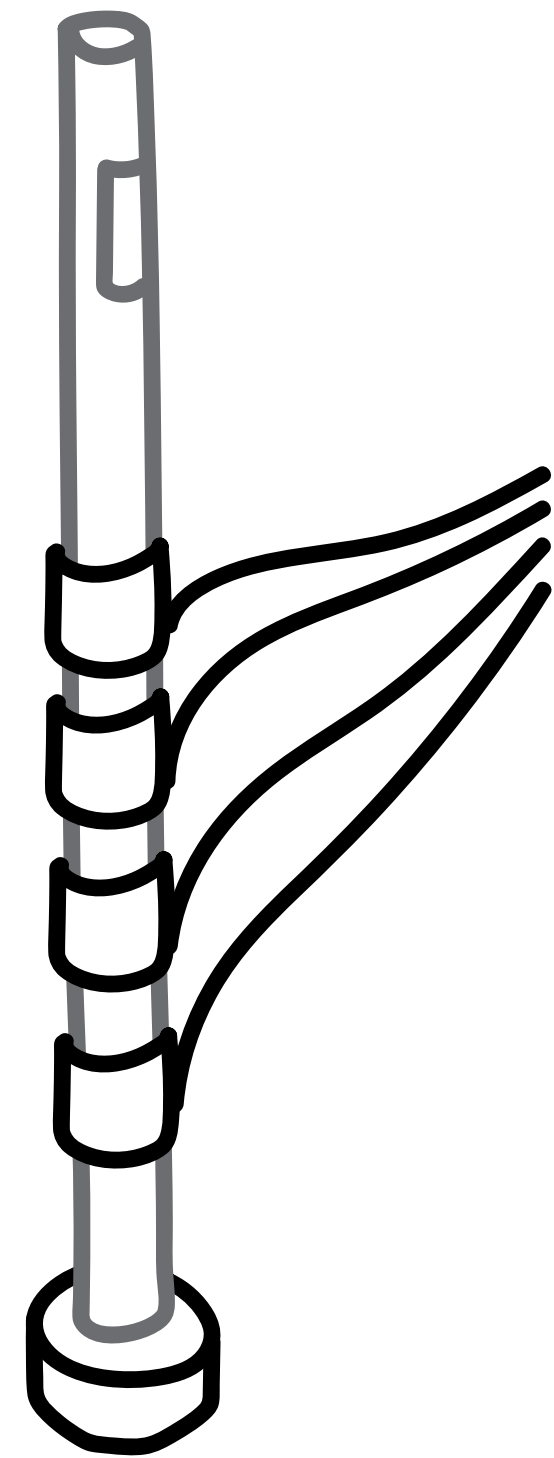
WORKSHOP TOOL

Gears

	Speed	Pressure	Suitable for
 <p>Nteeth ~ 18</p>	75 cm ³ / turn	93 bar	Small, thin walled products 
 <p>Nteeth ~ 30</p>	150 cm ³ / turn	47 bar	Large, thick walled products 

Injection Unit

- Optimize, not change radically



Fiberglass wool insulation



Sheet metal insulation



No insulation



Custom valve gate



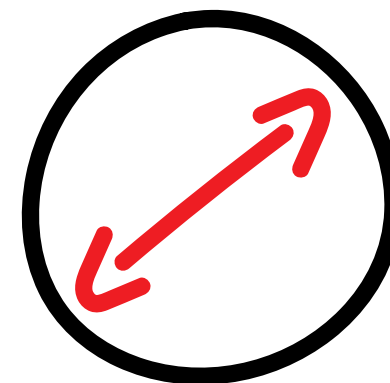
Valve gate



Open nozzle

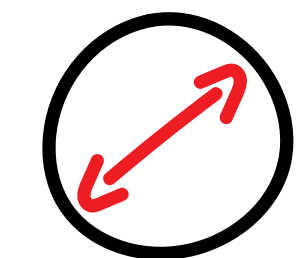


Ø 30 mm



INDUSTRIAL TOOL

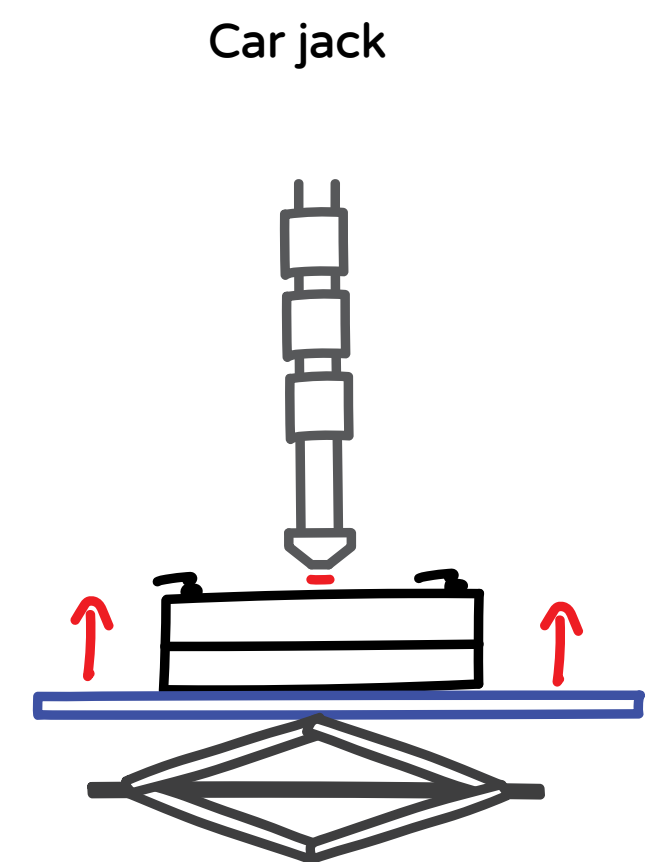
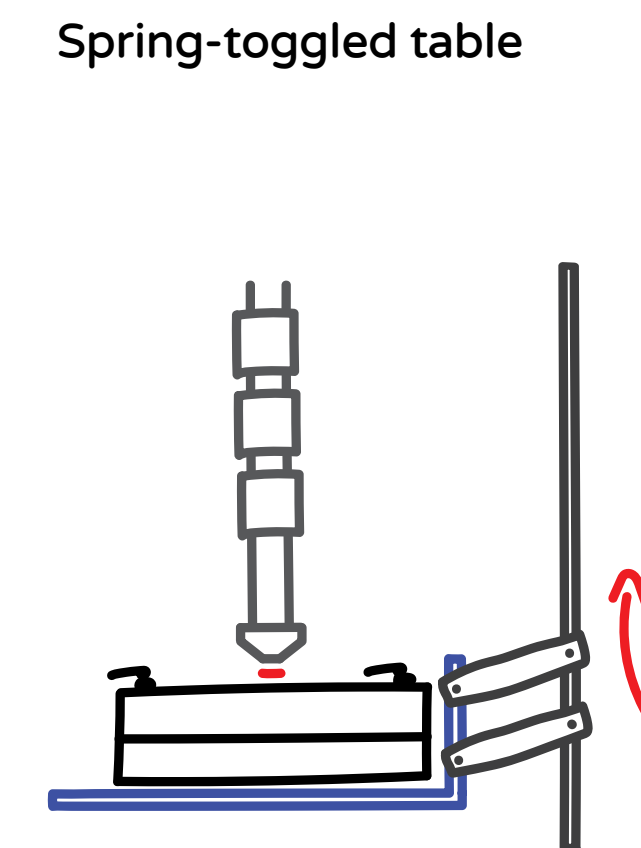
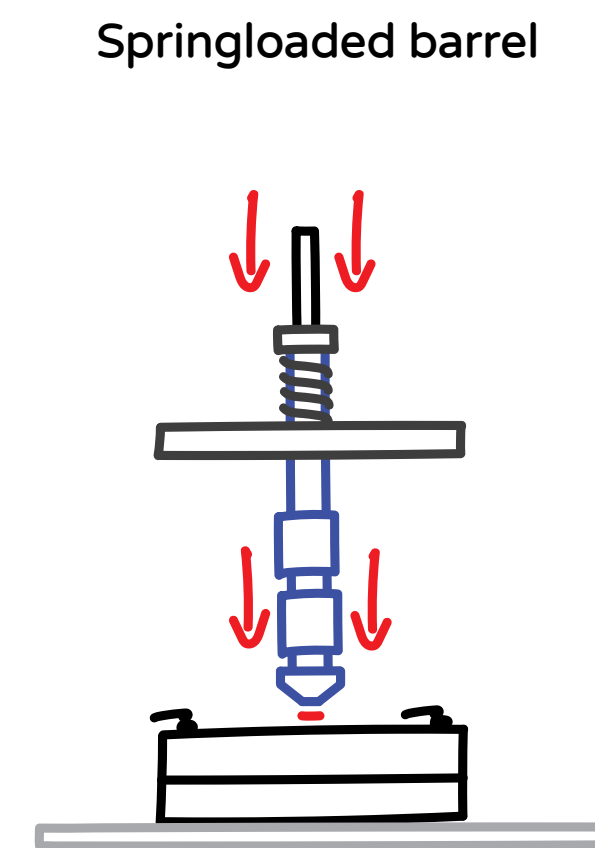
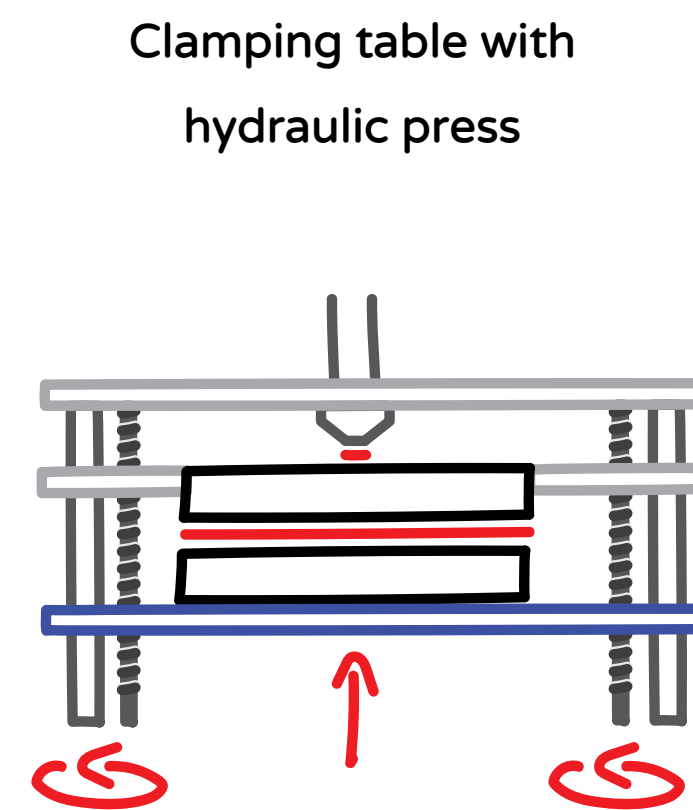
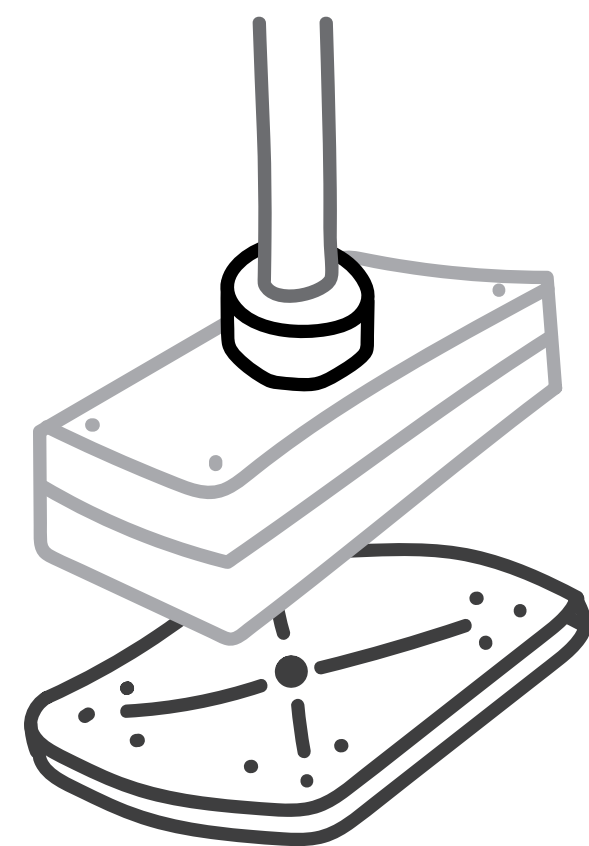
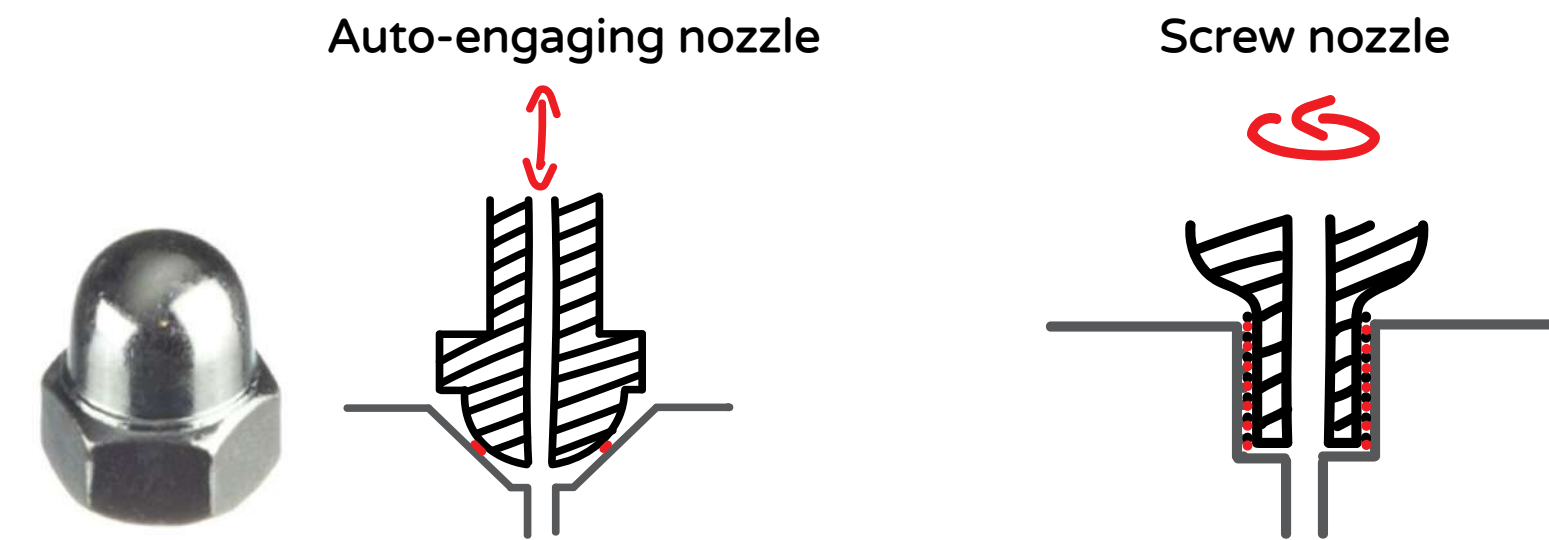
Ø 26 mm



WORKSHOP TOOL

Nozzle Clamping system

- Minimize cycletime
- No more screwing on hot molds



INDUSTRIAL TOOL

WORKSHOP TOOL



DESIGN DIRECTION

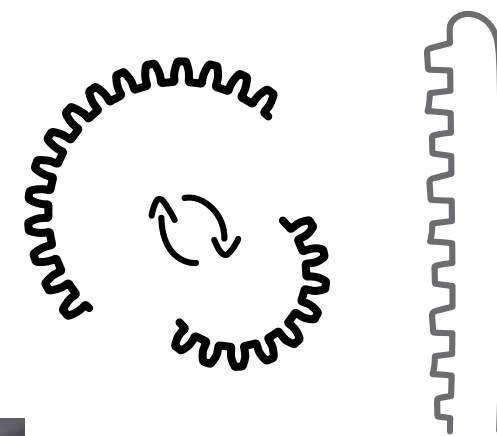
Main design Direction

Arbor-system

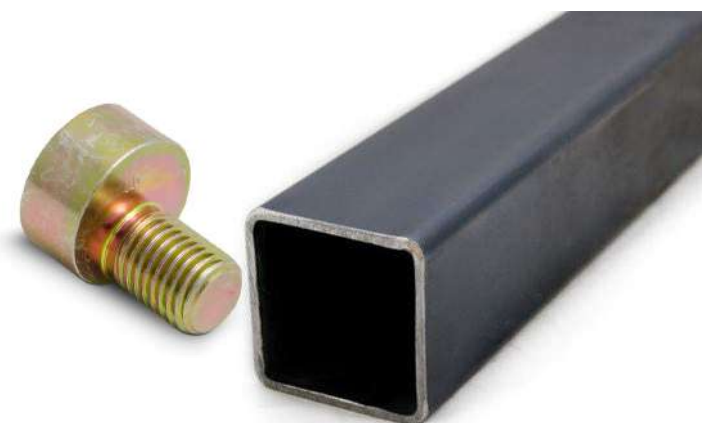
Square rack
(separate plunger)



Multiple gears, ability to
switch use-cases

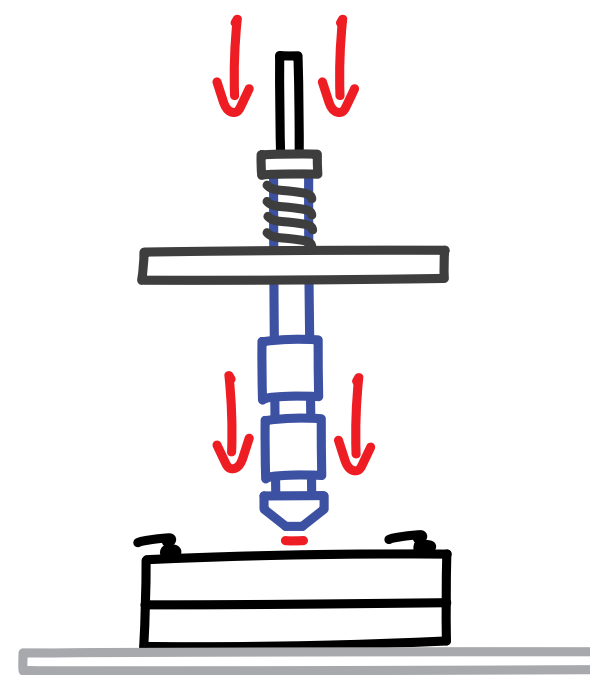


Gearbox integrated in frame,
eccentric nuts for alignment

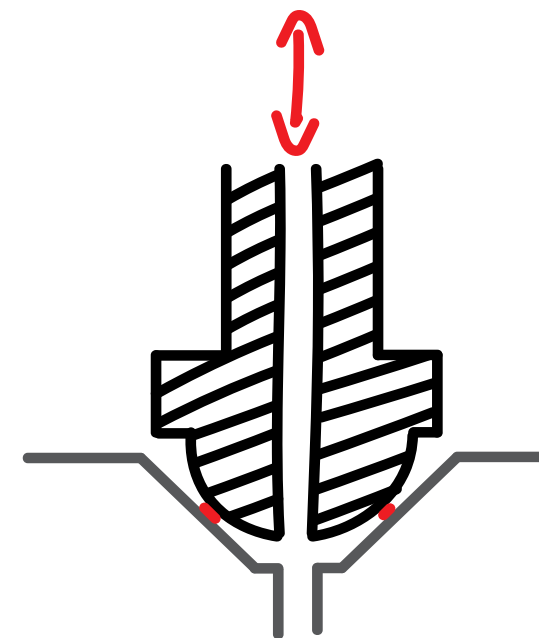


Nozzle and clamping

Springloaded barrel



Auto-engaging nozzle



Open nozzle

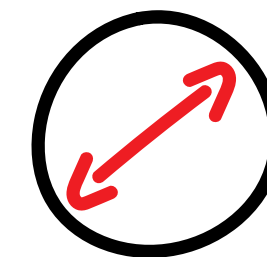


Injection unit

Sheet metal insulation

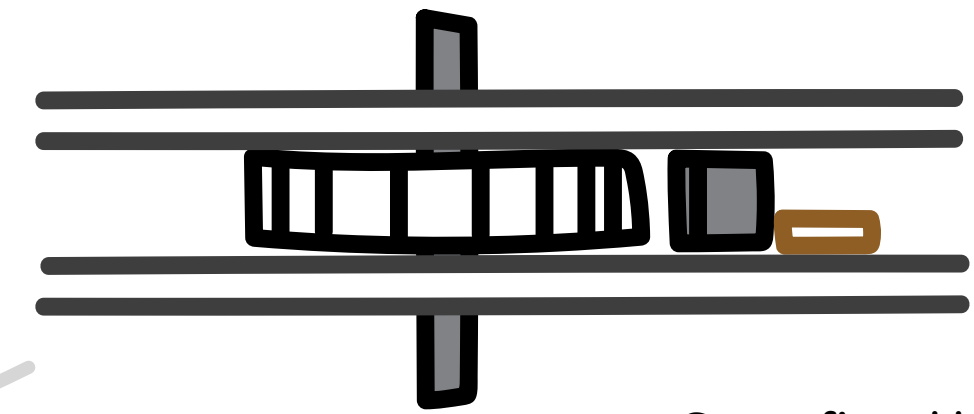
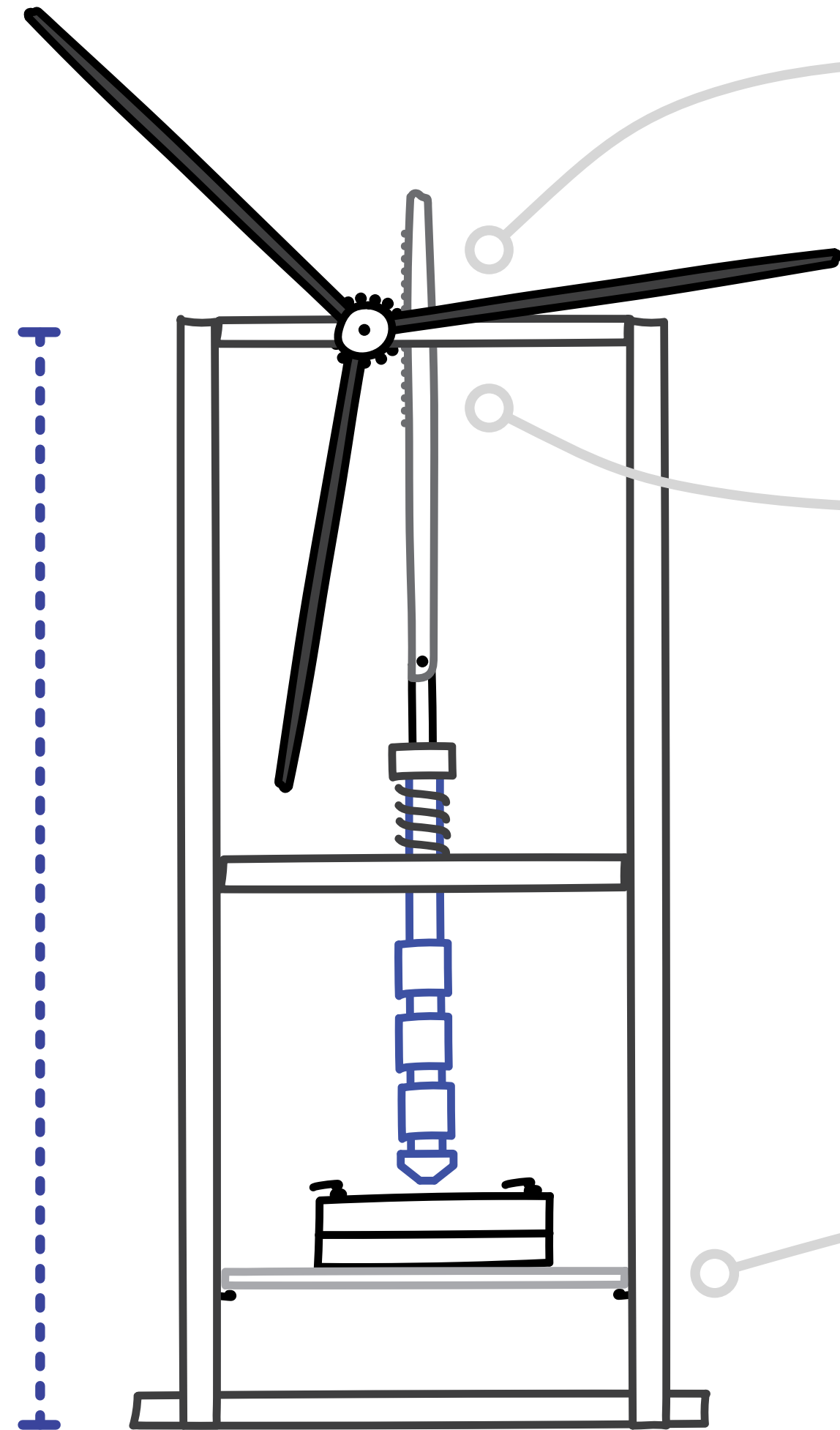


Barrel Ø 26 mm

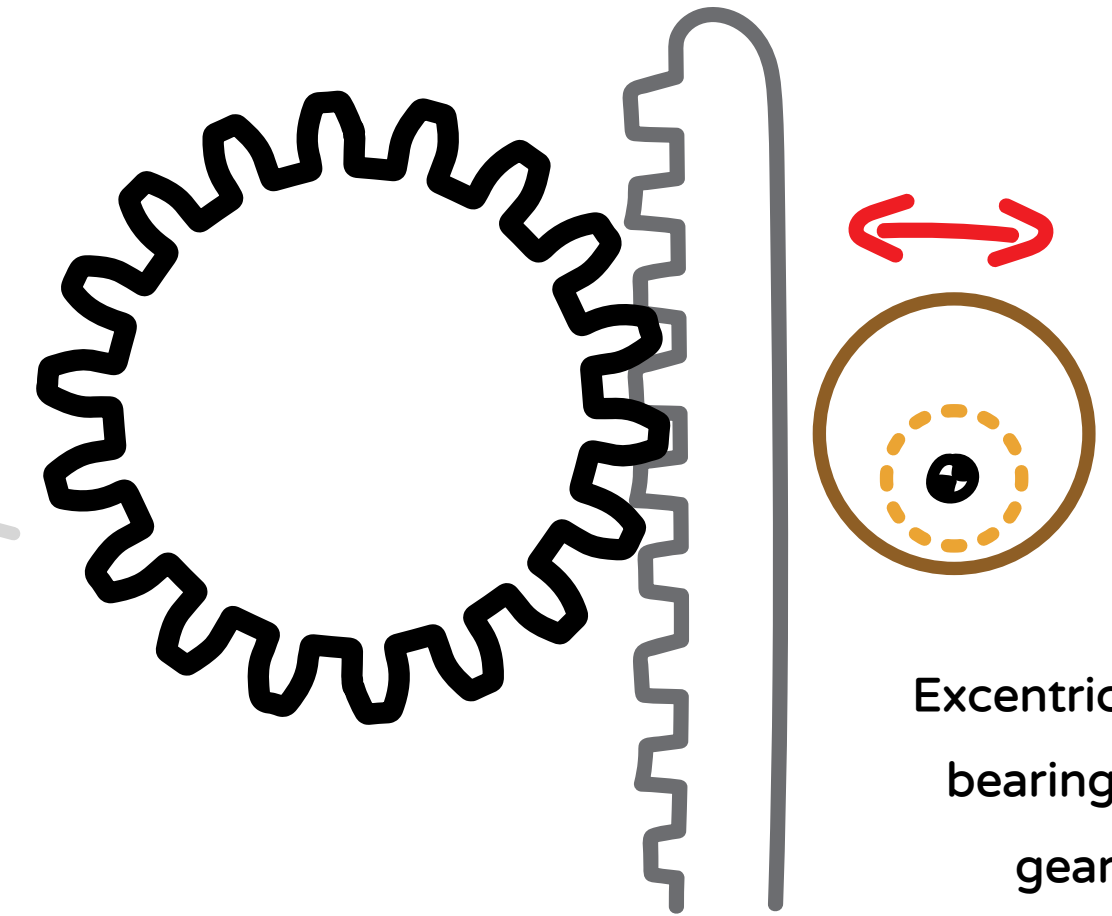


Main design Direction

110 - 120 cm high



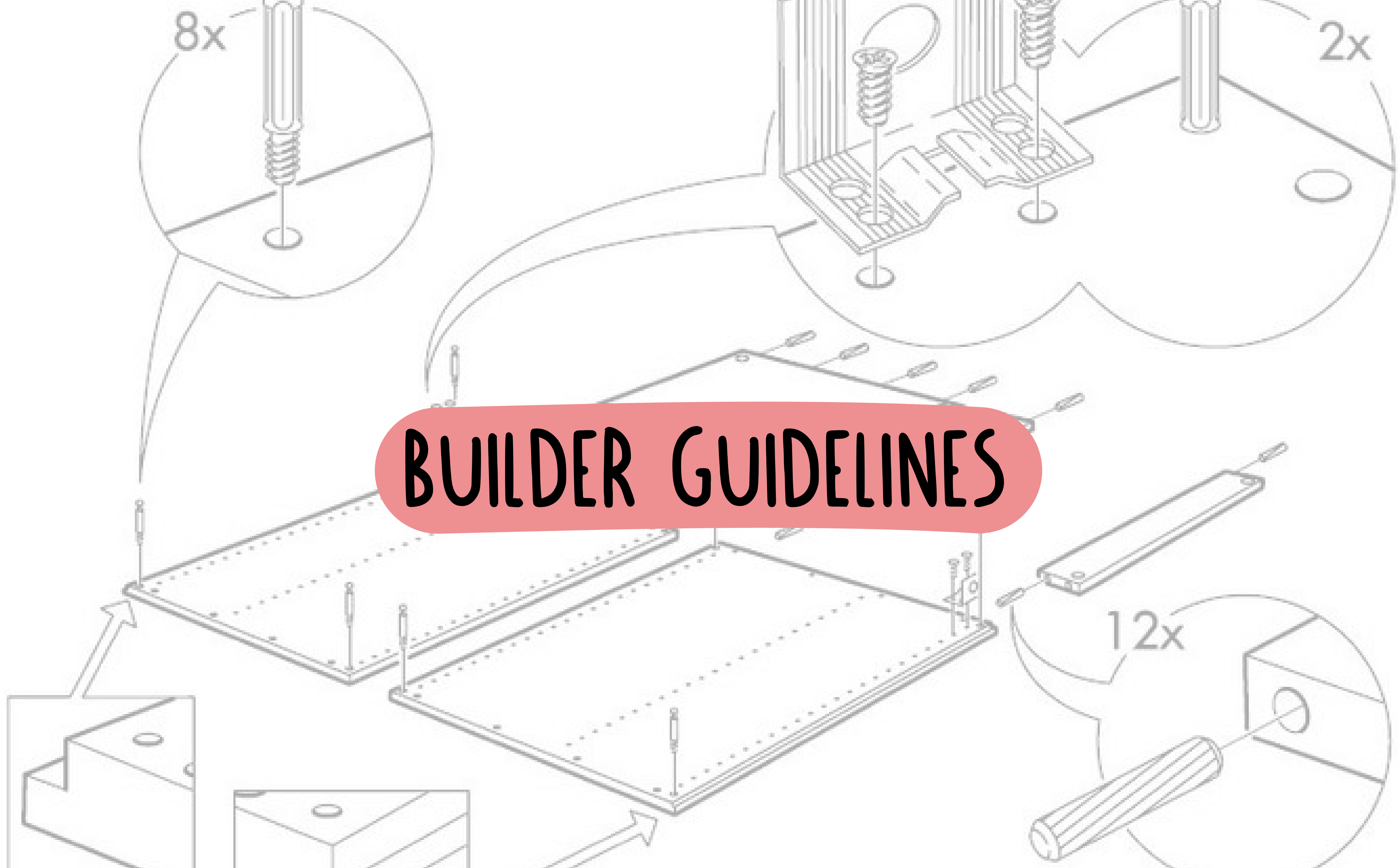
Gears fitted between frame tubes



Eccentric nut (with ball bearing) to finetune gear-rack link



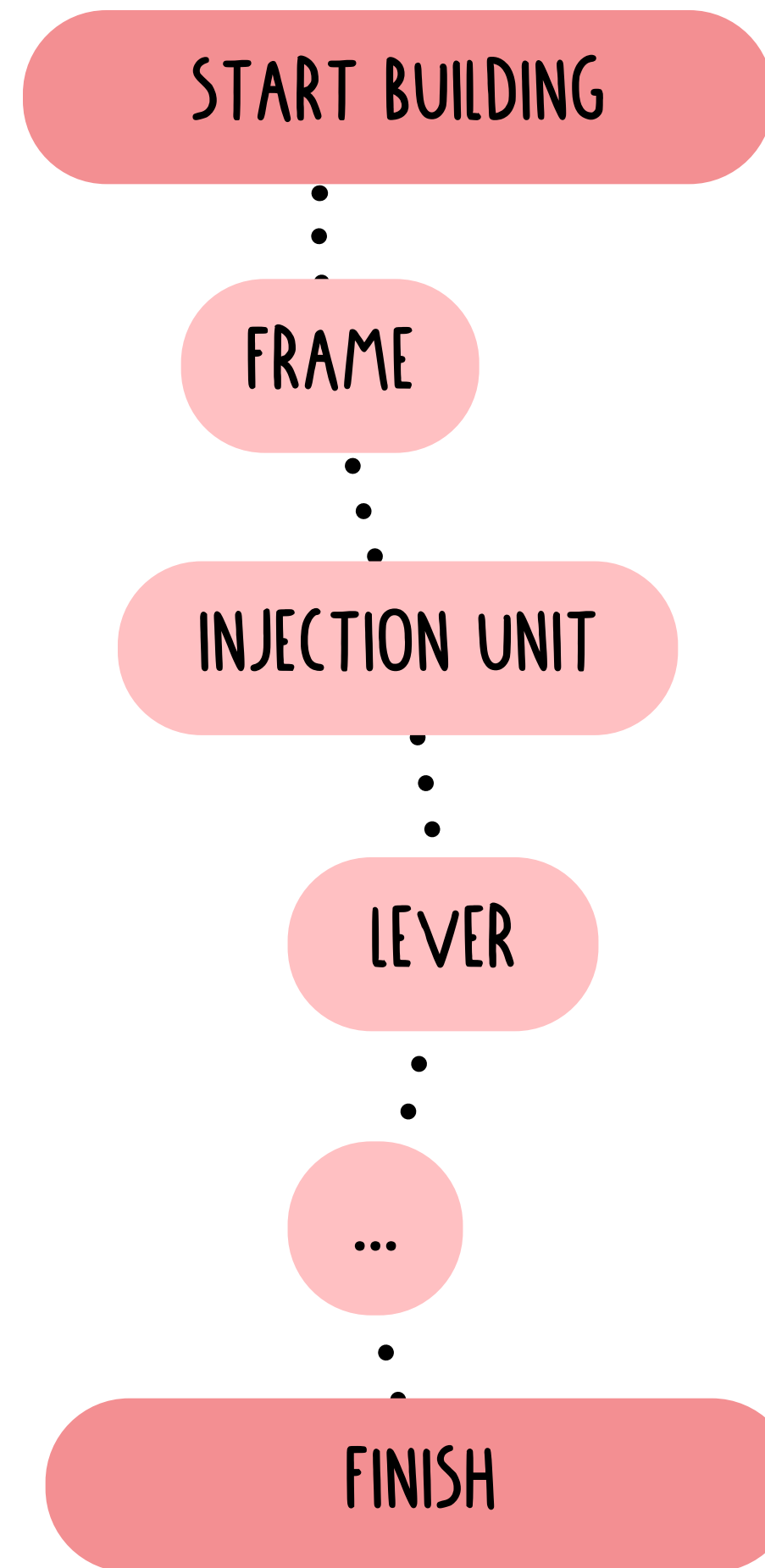
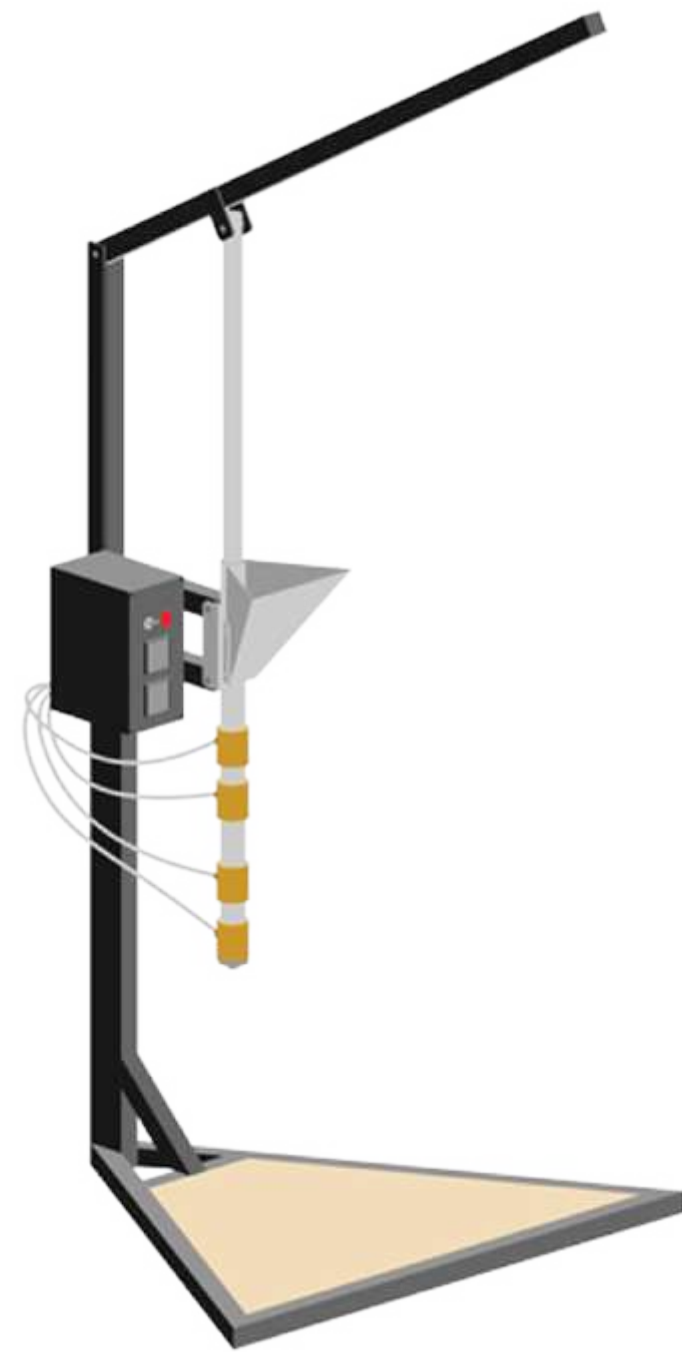
Movable mold table



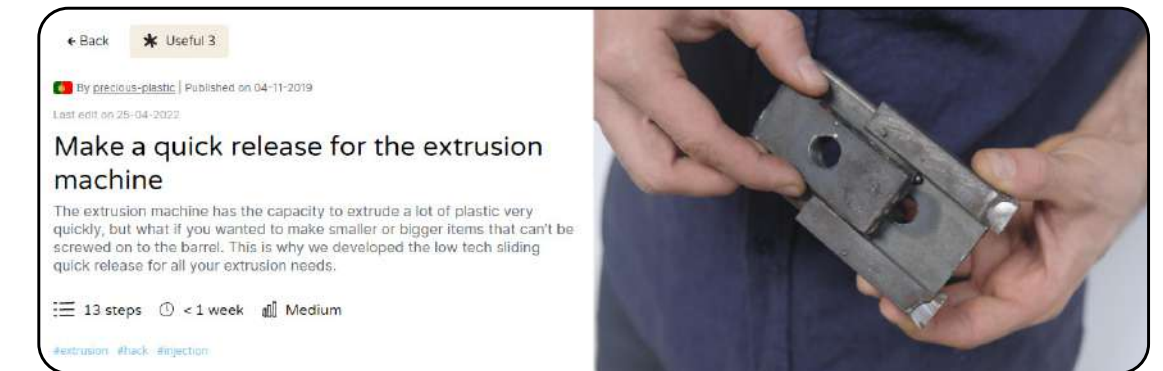
BUILDER GUIDELINES

Current situation

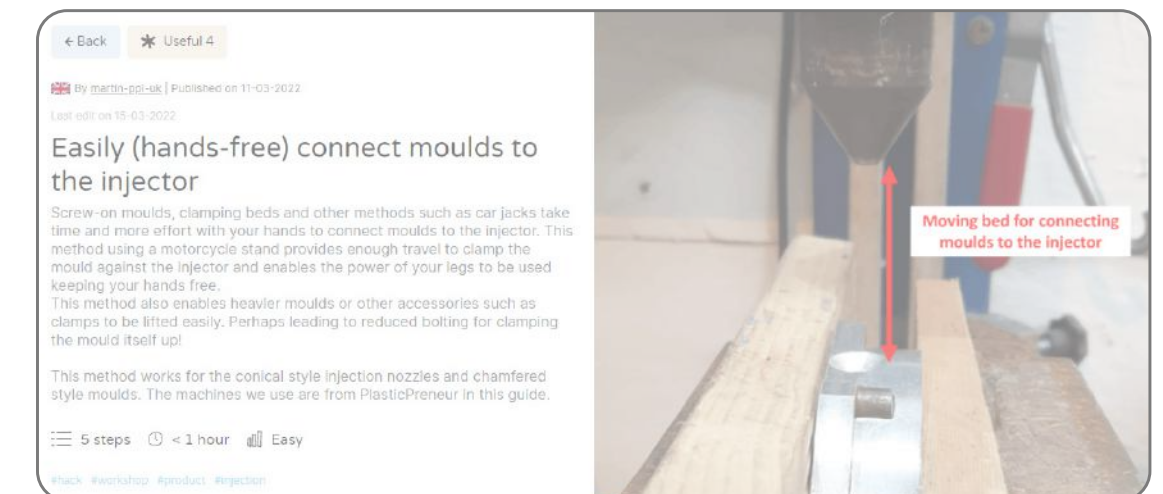
- Linear, inflexible build
- 'One size size fits all'



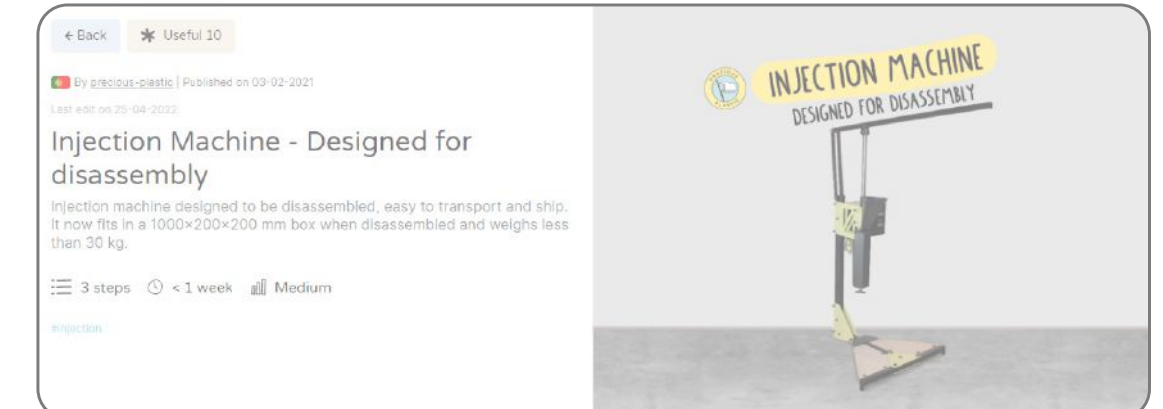
Simple add-on



Advanced hack

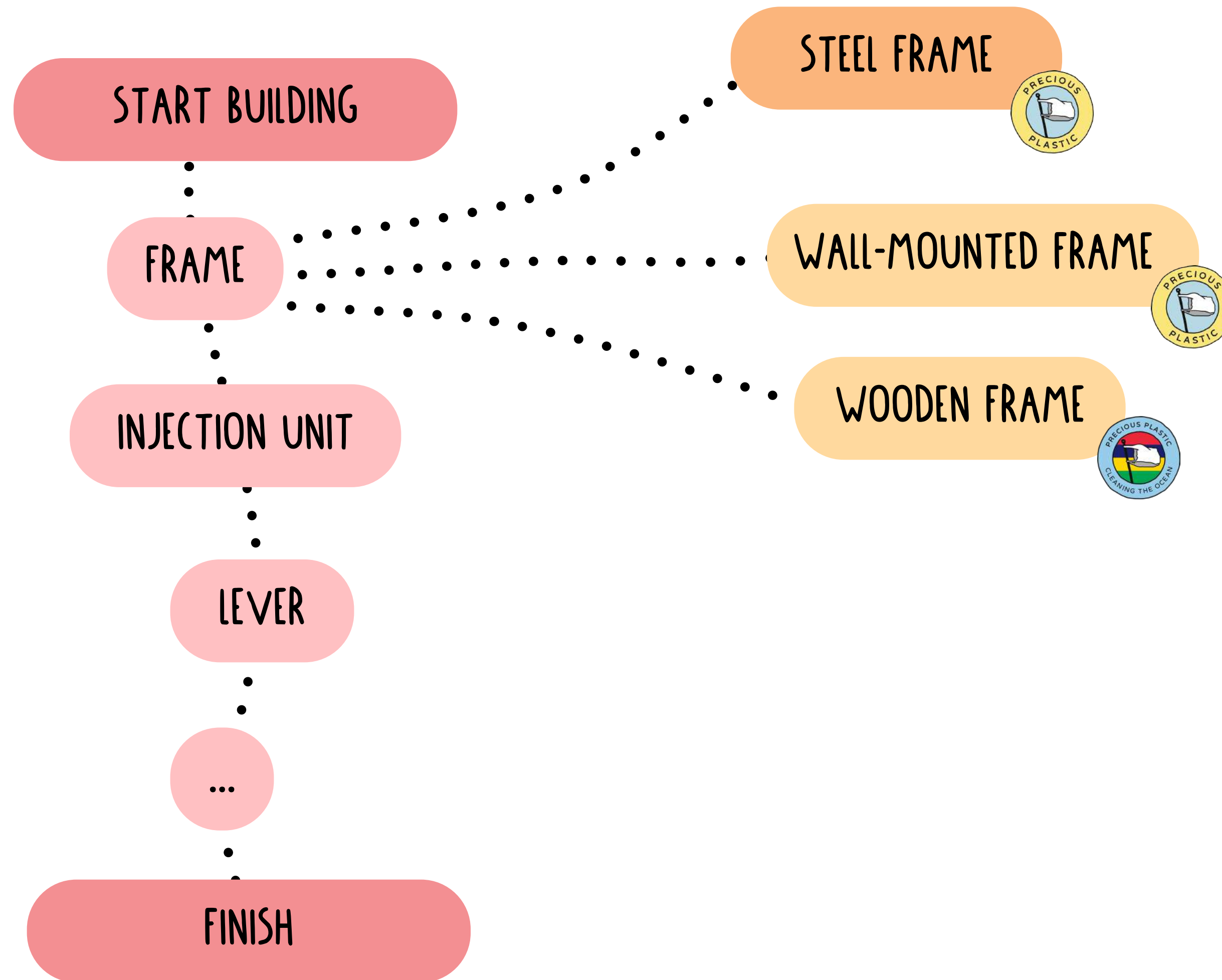
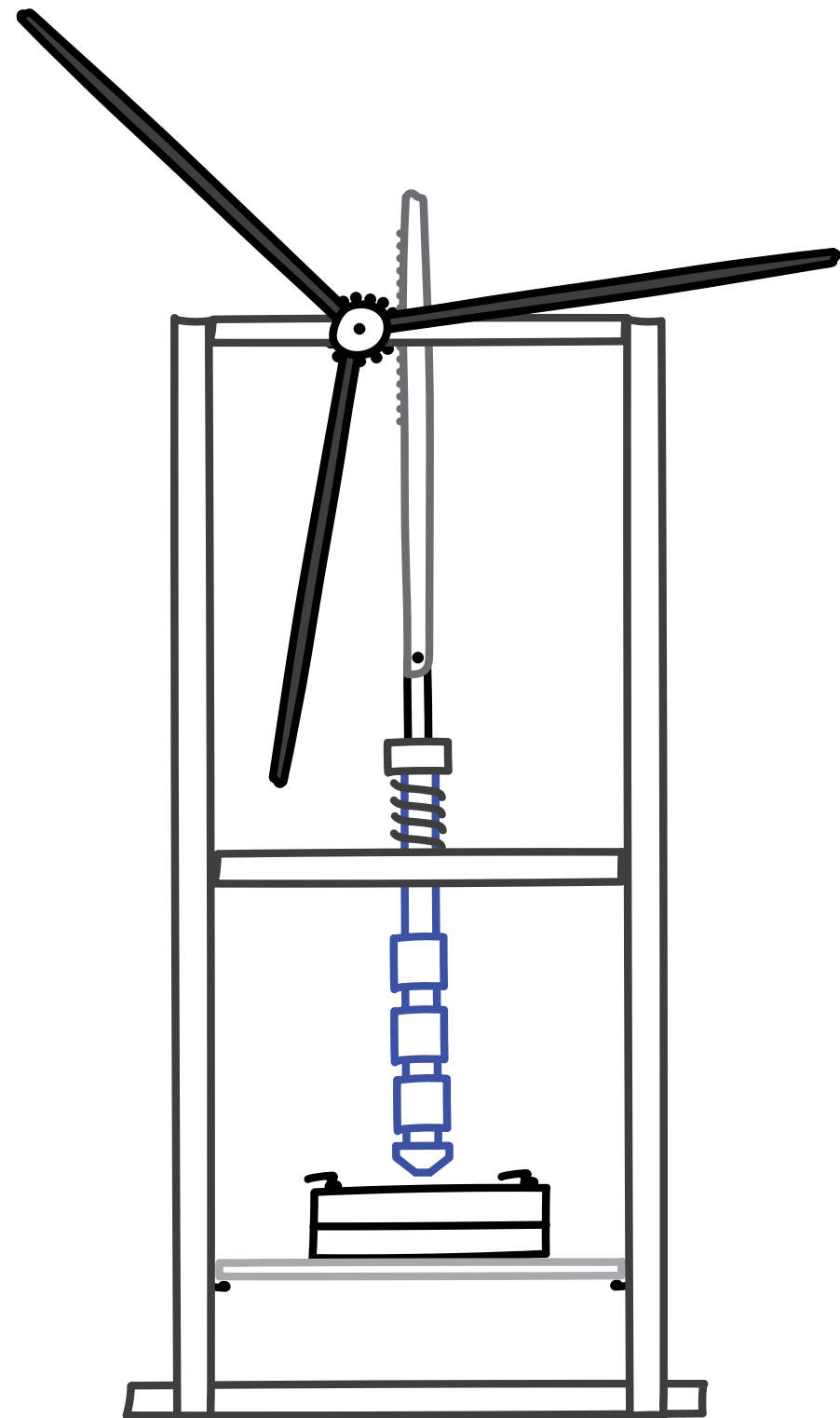


Different concept



Envisioned situation

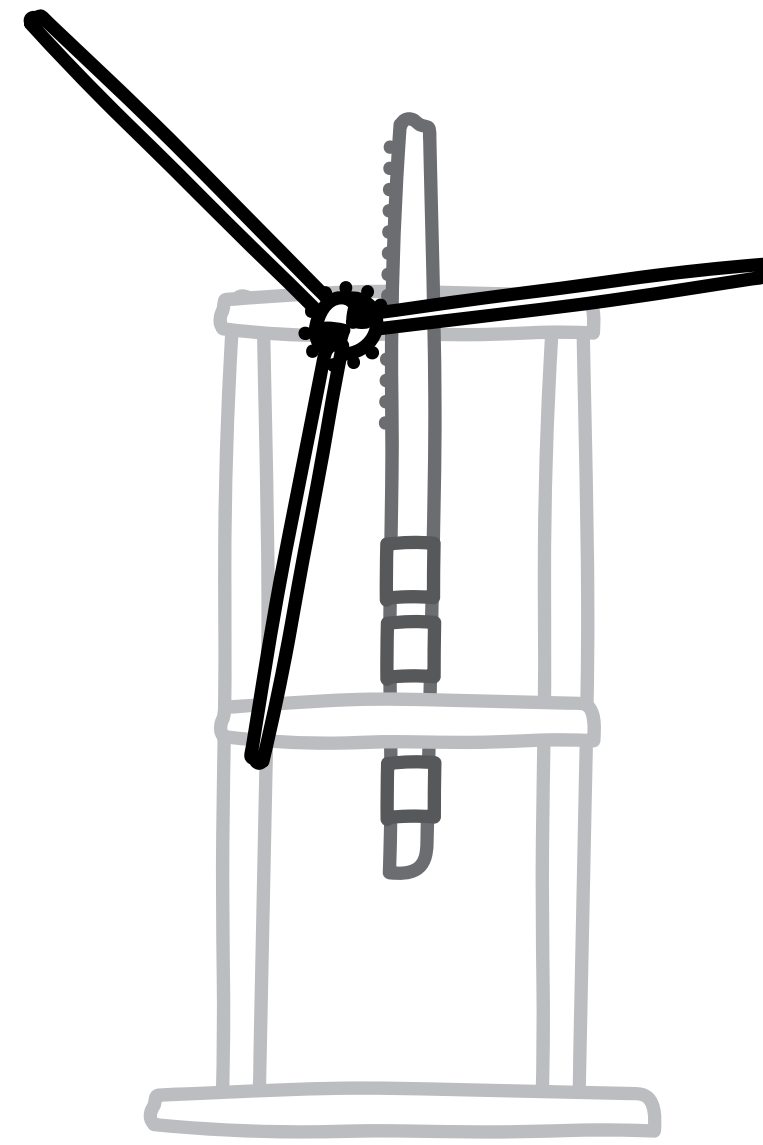
- Self composed, tailored device
- Modular to the max



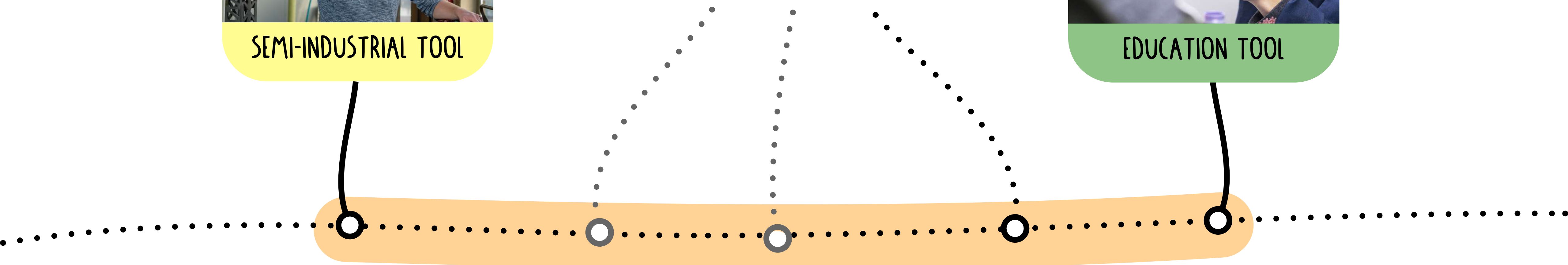
Which use-case for the Arbor-press?



SEMI-INDUSTRIAL TOOL



EDUCATION TOOL





FEEDBACK TIME!

(SLIDES ARE IN CHANNEL)