The incorporation of a movement system in a hydraulic press

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Aim of the Project

The Aim of the project is to design and build a safe system of movement capable of aiding in the transportation of a pre-existing break press, the design should will consider ergonomic features.

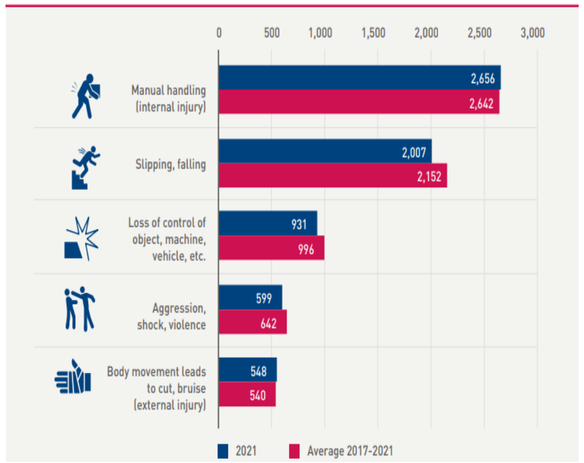
Background

A hydraulic press is a machine used in many areas primarily in the bending of sheet metal and crushing of objects. These presses often weigh 200-300kg and can reach upwards of 1000kg. The need for an ability to move the press was of paramount importance as it was intended to be used for educational purposes. The design needed to be strong but also light. It also needed to be ergonomically safe as it would be moved raised and lowered by hand and subsequently pushed by hand.

Ergonomics

The importance of ergonomics cannot be underestimated in this build, almost 35 % of all workplace accidents are from pushing and pulling similar to that required in this project. For this reason handles were added to the build and push and pull stickers added to the correct locations.

Top five reported non-fatal injuries by trigger, 2021 and five-year average 2017–2021 (HSA)



3D Printing

The incorporation of 3D printing into this project added an extra aspect of design to the build. The roller support seemed the most logical place to utilize 3D printing, the rollers would need to be able to move freely both up and down the outside of the channel iron in order to safely guide the mechanism up and down its necessary travel path. Poly Lactic Acid (PLA) was chosen for the material to be used due to its strength properties. An infill percentage of 45% was used to ensure no failure occurred.

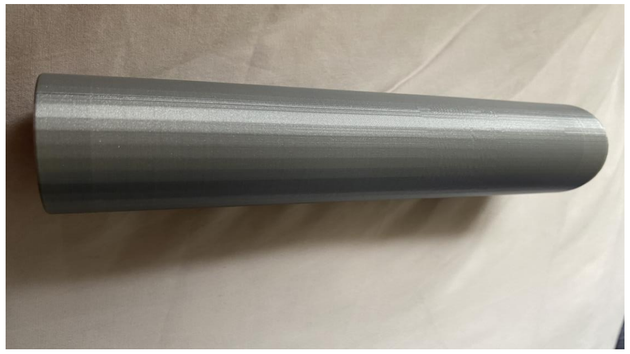


Photo of: a sample 3D printer roller

Design Comparison

Design Comparison						
	Cost	Complexity	Functionality	Ergonomics	Safety	Total score
Design number	Score out of 10					Score out of 50
1	5	9	6	2	7	29
2	3	6	4	7	3	23
3	8	7	9	9	8	40

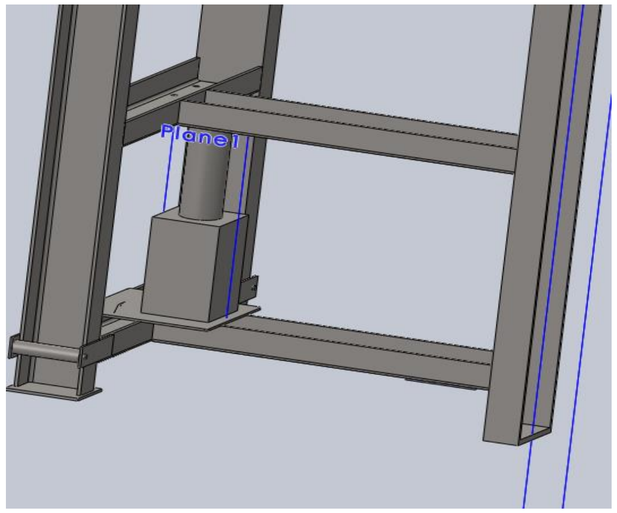
A design comparison was carried out amongst potential design ideas ranking them on a scoring system from 1 being the worst to 10 being the best. The third design was the best design overall as it scored the highest out of all the designs through the ranking system.

Design

The design process was mostly formed on the basis of existing knowledge on equipment used to transport large stationary machines. Hydraulics and small bottle jacks are commonly used to lower and raise pieces of machinery.

Above is the bottle jack used in the final design

The incorporation of caster wheels is also common place in industrial settings to aid in moving machinery. Caster wheels are small independent wheels that move in a 360-degree rotation in the opposite direction of any force applied. A series of solidworks models were also made in the design stage to help finalise the design.



Above is a model of the solidworks designs

Conclusion

In conclusion the design stage was a success incorporating many design aspects used in industry, the addition of:

- ⊡Caster wheels
- ⊡Bottle jacks
- ⊡3D printing

The three aspects mentioned above all contributed massively to the design and build stage aiding in the ease of the design. The build overall was largely successful as most of the original objectives have been passed with ease. The final design was capable of lifting the press from the ground and being moved from one location to the other

Acknowledgements

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References

annual_review_of_workplace_injuries_illnesses_and_fatalities_20202021.pdf (hsa.ie)