Takumi Swarf Compactor

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Aim of the Project

Restore a swarf compactor into working order by;

- Strengthening to prevent failure
- Design + manufacture missing parts
- Get the hydraulic pumps and arms in working order
- Write a PLC programme to automate the swarf compactor

Background

The swarf compactor project started three years ago in collaboration with Takumi Precision Engineering, who are an engineering company based in Raheen Co. Limerick. The swarf compactor was designed to compact swarf into discs so the material and coolant can be separated for recycling. The swarf compactor is made up of many components, but the main parts are the hopper, feed screw, pre-compactor, main compactor and push rods which are all aided by hydraulics and a PLC control system.

How Swarf Compactor Works

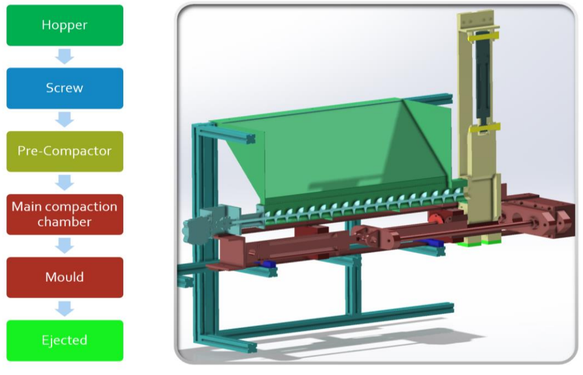

Figure 1: Process Cycle of the Compactor

The swarf compactor works by adding swarf into the hopper which then is feed to the screw. The swarf is forced the down to the pre compactor by the screw. The hydraulic arm in the pre-compactor forces the semi compacted swarf down into the mould. The coolant gets separated from the swarf and down a shoot to be recycled. The rod pushes the compacted swarf down out of the mould into the recycling bin.

Problems + Solutions

- Signs of damage to the corner joints on the frame due to stress
- Upper and the lower braces were added to safely mount the pre compactor to the main compactor stiffening up the frame to reduce stress.
- Upon further inspection it was clear there was no means for the compacted swarf to be ejected from the compactor mould. To solve this problem there were two 640mm steel rods designed.

Design

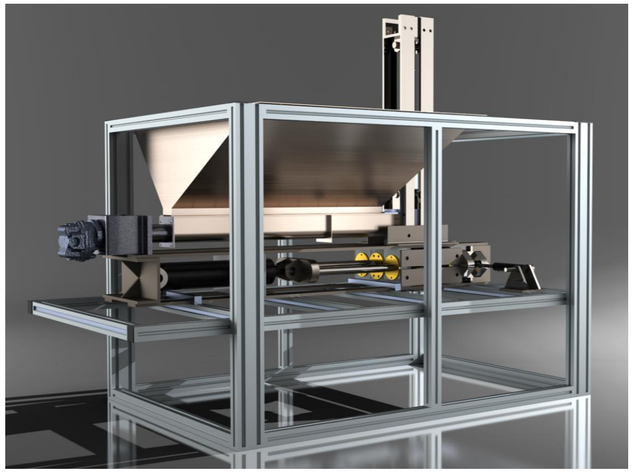

Figure 2: SolidWorks render of swarf compactor

- Full solid model was made up using SolidWorks
- Each part was measured individually before being modelled using SolidWorks
- New Parts needed for Compactor Function designed around Current Components
- 10mm Flat Steel used as bracing to tie together Barrel Carriers .
- 15mm Flat Steel and Angle Iron used to Strengthen the joint of the Compactor assemblies.
- Push Rods and end caps design to allow ejection of briquettes in time with the compaction Stroke
- Bushings for push rods which sit into Previously made Barrel Carriers designed to allow smooth actuation of push rods
- Pin for main compactor Hydraulic Cylinder and Push Rod Butt Plate
- Pre-Compactor and Main Compactor sub-assemblies modified to accommodate new components for strengthening and functionality

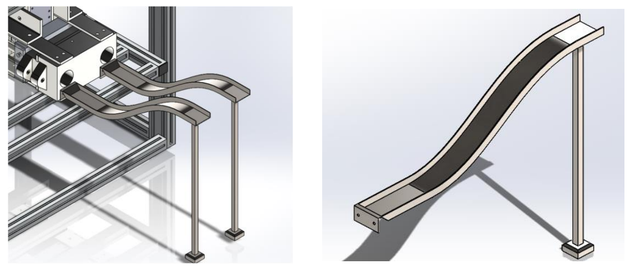

Figure: 3 Briquette conveyor

Additionally with the design of the braces for the stiffening of the swarf compactor overall, there were also early-stage designs for a coolant reservoir and a briquette conveyor developed.

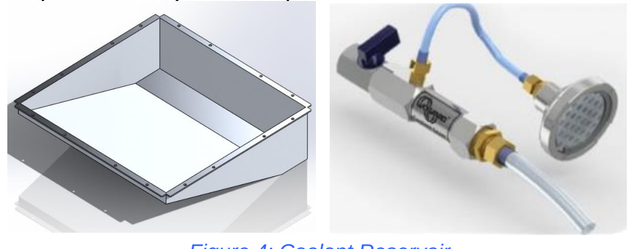

Figure 4: Coolant Reservoir

The function of the coolant reservoir is to catch any remaining coolant that may be mixed with the swarf for the purposes of recycling as the waste of coolant can be very costly. The coolant reservoir has the potential to be automated using capacitive sensors and pumps. The function of the briquette conveyor is to transport the briquettes from the molding block of the swarf compactor to a bin for recycling. This uses the movement of the ejection process to move the briquettes along doing away with the need for a belt.

Manufacturing

Manufacturing began with the machining of The Compactor Rod and Coupler on October 30th. The following weeks proceeded with machining of the parts necessary for the ejection system and the strengthening of the mate between the Pre-Compactor and Main Compactor sub-assemblies. Work on these parts were on going up until week ending of the 29th of November 2020. Modification of previously manufactured parts proved difficult due to poor material choice and design by previous groups taking part in this project. In Total 31 Components were modified or manufactured from scratch

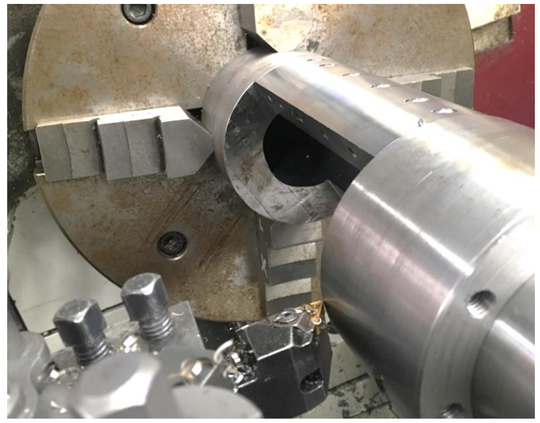

Figure 5: Compaction Barrel in Lathe

Assembly + Testing

Figure 6: Suitable figure caption

The compactor was assembled using numerous M8 and M12 socket head bolts of various length. Due to the deadline limitations of the poster were unable to commence testing

Conclusion

- Original compacter parts have been modified
- A fully rendered solid works model has been created
- An ejection system has been designed and implemented into the design
- A concrete concept for the brick conveyor and coolant reservoir have been designed.
- The Compactor is ready for a test run.