



CASE STUDY

Automated Press Bench



Automated Press Bench – Boksburg – 2017

Led by: Neil Koekemoer – Mechanical Engineer; Cornel Pieters – Mechanical Engineer

Customer: Joy Global

CUSTOMER BRIEF

The customer approached P&C Mining Services to design and build an automated press bench, which can press in the pins on the tracks of underground mining machinery. Previously, the pins were hit in with a hammer by an employee. P&C Mining Services were tasked in improving the previous design made by the customer. This new and improved design is fully automated with added features whilst being safe to use and will be less labour intensive.

The aim was to design an automated press bench that will be safe to use as well as outperform an employee in pressing in the pins, which will ultimately increase the production rate.

COMPETITIVE ANALYSIS

Previously, an employee had to hit in the pins with a hammer. This does not only have health and safety risks, but also stalls the production. The customer's initial press bench design included a cylinder that is stationary, the pins will be placed underneath the cylinder where after it will press in the pins.

The press bench designed by PCMS is completely automated. The tracks will be placed on the bench (23 Tracks) where after the pins will be placed in position. The rest of the process is fully automated, where an operator controls the dynamic carriage. The new design also uses less hydraulic pressure from the power pack. The previous design used 700Bar which poses as a health and safety risk. The new design barely uses 300Bar of pressure to press in the pins. The new design also has added safety features, for instance adding a Dead Man Switch to the controller. This will stop the dynamic carriage immediately in case of an emergency. The new automated press bench is less time consuming and less labour intensive, saving the customer on potential safety risks as well as providing an increased production rate.

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Tel: (010) 060 9833 / 0861 723 000. | Email: sales@pandcmining.co.za | Website: www.pandcmining.co.za | Fax: 0866 073 661

Physical Address: Unit 2 Protea Business Park, No 30 All Black Road, Anderbolt, Boksburg, Gauteng, South Africa



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CHALLENGES

A few challenges surfaced from the old design done by the customer. One of these challenges where designing a new press bench from the old design by incorporating the old design instead of designing a press bench from scratch. Thus not having design freedom posed as a challenge.

Another one of the challenges was using some of the old equipment with the new design. The customer had purchased a hydraulic power pack for the old design. This power pack was purchased to suit the old design, which worked on a stationary instead of an automated manner. Thus the power pack did overheat and it tripped the overheat relay multiple times. After strenuous tests, it was concluded that the power pack bought by the customer, was specified for intermittent use only. A new continuous use power pack was purchased, which solved the problem.

We arranged for tracks to be used in the initial commissioning process from the customer. These tracks and pins where old and worn. Thus at the initial commissioning, the press bench pushed in the pins with ease. This was a challenge, because when the final commissioning date approached with new tracks and pins, the pressure on the power pack was too low to press in the pins completely. This resulted in adding a 300Bar addition to the power pack to press in the pins.

All the challenges resulted from having to work with old equipment and designs.

CHANGES

A lot has been changed from the old design to the new design. Firstly, less material was used to construct the new bench. This made the bench slimmer and more compact, yet providing the same amount of pressure required. It was also calculated that only 300Bar is needed to press in the pins. Thus by having less downward force, the bench was constructed with less material. Various proximity sensors have been added to the bench, to make it fully automated.

In the old design, the cylinder was in a static position. With the new design, the cylinder moves up and down the track, pressing in the pins as it goes. This is controlled by various PLC's (Programmable Logic Controller) to ensure that the bench is fully automated. The tracks rest on a High density polymer liner, which eliminates steel on steel contact.

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LIMITATIONS

Keeping to a strict budget was the only limitation of this project.

PRODUCT REQUIREMENTS

Fully Automated

To justify this design, the bench must be able to outperform an employee, to increase the production rate.

Safety first

The design was made whilst keeping safety in mind. The bench is designed with a suitable safety factor, to ensure the safety of employees during operation.

Design

This project's design included 3D concept design, detailed design drawings, manufacturing drawings, installation drawings and costing.

Review

The automated track pin press bench successfully passed the commissioning process and exceeded the customers' expectations. The bench can push in the pins at 25% of the time it takes for an employee to hit in the pins. The added track winder also exceeded the expectations by rolling up the 23 tracks with ease, making it easy to ship.

Where the customer's specifications met?

| | |
|----------------------|---|
| Safety | ✓ |
| Maintenance friendly | ✓ |
| Cost effective | ✓ |

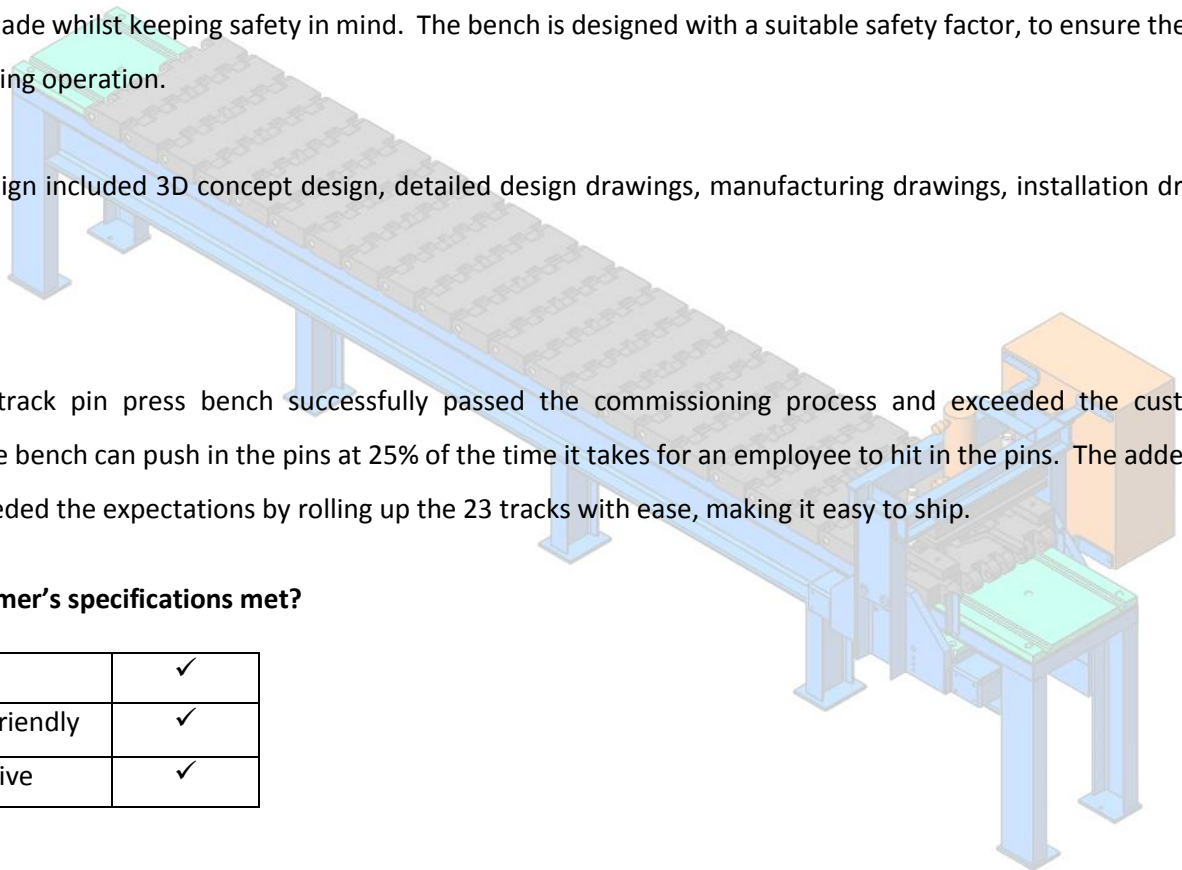




Figure 1: LEFT: The automated track pin press bench. RIGHT: the Track winder

Old design (left) versus new design (right).



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