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| **Topic entry (tick boxes that are applicable) 1 X 2  3  4  5  6  7**  **8** | |
| **Entry number (MPA Ref)** | 22126 |
| **Title of Entry** | Kiln Crash Prevention System |
| **Name of Company** | Mansfield Sand Co Ltd |
| **Location** | Crown Farm Brickworks |
| **Video**  **(if yes, please include URL for video)** | No |
| **Other resource**  **(if yes, please include description)** | 1 image |
| **Fatal Theme (tick boxes that are applicable) 1 X 2  3 X 4**  **5 X 6** | |
| **BACKGROUND** | |
| Over several years it was noted by the site team that pallets of bricks being placed into the kilns for curing, could cause damage to the kiln raking system or the automated equipment used to place them. Each incident could result in damage, at varying degrees, to the kiln structure or the finger car and elevator used to hold or move the pallets of uncured bricks. In addition, bricks could be dislodged from the production pallets causing them to fall from height or become precariously balanced on the pallet with potential to fall. In extreme situations the finger car (weighing several tonnes) could be tipped up requiring recovery to a safe position.  To rectify the situation, employees were being put at risk to deal with the initial collision, requiring removal of bricks and pallets that might fall and undertaking tasks to stabilise and recover the finger car. Once the initial incident was dealt with, the kiln structure would need repairs resulting in working at height to replace damaged structural elements.  As well as the stated H&S hazards present each kiln crash resulted in production downtime whilst recovery and repair work was completed. | |
| **MANAGEMENT OF PROCESS** | |
| After it was identified in company production meetings that this was a significant problem area that needed to be improved, the engineering and site management team began to work through potential solutions.  The process was very iterative and did not follow a linear path to the solution but included the steps outlined below.  Initially they had to identify what was causing the kiln crashes. The investigative team consisted of the site manager, shift supervisor, electrical and mechanical engineering team. The result of the investigation identified several causes.  The crashes were traced back to the production pallets becoming skewed on the conveyor transferring them from the press to the kiln. A skewed pallet would catch the kiln rails and jam against the finger car, pushing it against the kiln structure which was the weakest point, causing damage to rails and uprights.  The investigation also identified that pallets may become overlapped or butted up to each other on the infeed conveyor. Normally two pallets are paired up in the elevator, but if they are overlapping or butting, the system could on occasion miss count and allow three pallets in. This either resulted in a pallet being dropped from the finger car/elevator or passing through the system and being placed in the kiln where they would collide with other pallets already in place, resulting in damage to the structure and usually dropped pallets and bricks.  Once identified, solutions to the causes were investigated. Several suggestions were made, including mechanical works to prevent the slewing, and overlapping of pallets. None of these ideas appeared to provide a guaranteed solution that would prevent a future incident. Solutions requiring trip wires and sensors on the elevator and finger car were suggested but dismissed, as again they would not provide a fool proof solution.  Eventually the site electrician and mechanical fitter were tasked with designing a sensor-based system to identify skewed, doubled or butted up pallets on the infeed conveyor. A completely new sensor array was designed to monitor pallets passing through, backed up by a plc control system, it would identify pallets that did not meet the required specification to pass safely into the kiln system. Any such pallets were stopped on the conveyor and an alarm raised allowing the plant operative to intervene and straighten / separate pallets by hand at ground level.  The system has been shared with the original equipment manufacturer. | |
| **BENEFITS** | |
| The new system has now been in place on the infeed conveyor for over a year. In that time there have been no instances of a kiln crash.  As result we have seen the;  Elimination of working at height risks associated with recovering and repairing the kiln structure and equipment. Any potential pallets that could cause a kiln crash are identified and straightened or separated at ground level outside of the kiln enclosure.  Elimination of falling objects. A major concern was the risks involved in recovering from a kiln crash. As each crash would be unique there was no simple safe way of working. Pallets would often be precariously balanced at height with the risk of them and the bricks on and around them falling. A crash may be caused by a single pallet but usually resulted in multiple pallets being displaced. Employees are no longer exposed to these risks.  Elimination of need to access the distance guarding around the kiln automated plant and equipment removing the exposure to moving plant and equipment during plant recovery following a crash. Safe access for such work requires complex isolation to ensure all equipment is safe.  Elimination of manual handling risks involved in the recovery of fallen/displaced steel production pallets which are 115kg each.  Elimination of damage to the kiln structure (a critical structure) and to the elevator and finger car system within the kiln. The kiln and its equipment provide the backbone of the site’s production, and it is vital that it remains functioning to 100% capacity, which has been achieved.  Elimination of the need for personnel to work inside the kiln when recovering from a kiln crash, which operates at high humidity and raised temperatures resulting in a fatiguing work environment. | |
| **INNOVATION** | |
| The new sensor array is unique to Mansfield Brick and was developed wholly by the inhouse engineering team. We do not have anything else the same or like this in the workplace across both of our sites.  It has been observed that the normal approach in other similar production facilities to use mechanical means to condition pallets to conform to requirements is by centralising or aligning. These usually work to some degree but do not always condition pallets appropriately as the system is in effect dumb and does not look for specific problems as it tries to condition every pallet whether required or not. Their approach is different in that it only interacts when there is a problem identified and then requires human interaction to correct the problem before allowing production to continue. This is the principal reason for elimination of kiln crashes. | |
| **DEVELOPMENT & TRANSFERABILITY** | |
| The technique and technology are very transferable as it is not physically interacting with the production process just monitoring by sensor for pallet and product alignment or overlap. The sensor array can be placed over any palletised production line for bricks and blocks and programmed to sense pallet alignment etc.  The technology has been shared with the original equipment manufacturer who have stated they would like to offer a version for their new clients. | |
| **NB if document has embedded images try and include these**  **If other documents provided say additional information available.** | |