



Palletising Robot Cell

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Robot Store Ltd.



Robotic Palletising Cell

More and more we are finding industrial robots being used to perform palletising operations. Industrial robots are very well suited to this highly repetitive work.

There are a number of advantages in using an industrial robot for this work:

- Firstly as mentioned above this is a highly repetitive task which is very tiring for a human worker. The human worker building up products onto a pallet will require numerous breaks whereas the robot will be able to work 24 hours a day, 7 days a week if necessary.
- The industrial robot can lift much higher weights than a human worker. The recommended maximum weight for a human worker is 25Kg and this reduces when the movements require the arms to be outstretched in the case of building up large pallet formations. The industrial robot can work with payloads up to 1000Kg if necessary, although the most common robot types used for palletising tend to be robots with a payload capacity around 180Kg. In this case it's usually the required reach that dictates the robot size rather than the payload.
- The industrial robot will have a much greater palletising speed than a human can achieve. The cycle time between a product being picked up and placed and the robot returning to the pick position will be shorter than that which a human can achieve.

There are two different types of robot most often employed for palletising cells.

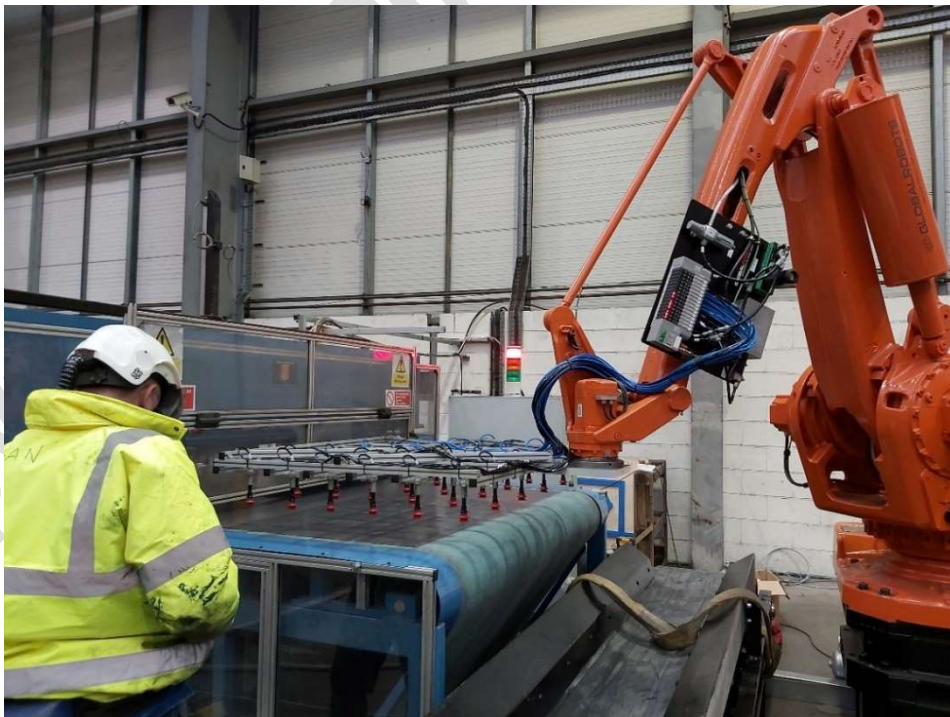
ROBOT STORE LTD.

Old Bank Buildings, Upper High Street, Cradley Heath, B64 5HY
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Standard six axis robot:



Dedicated four axis palletising robot:



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In the case of the dedicated palletising robot there are only four axes as opposed to six. This means that the tooling is limited in orientation to rotation solely around the vertical axis of the gripper. However, the majority of palletising operations do not require any tilting of the product so the advantage in using a dedicated palletising robot will be that the robot speed will generally be quicker and hence a reduced cycle time.

Having talked about the advantages and different robot type lets have a look at the main elements that make up the majority of robotic palletising cells.

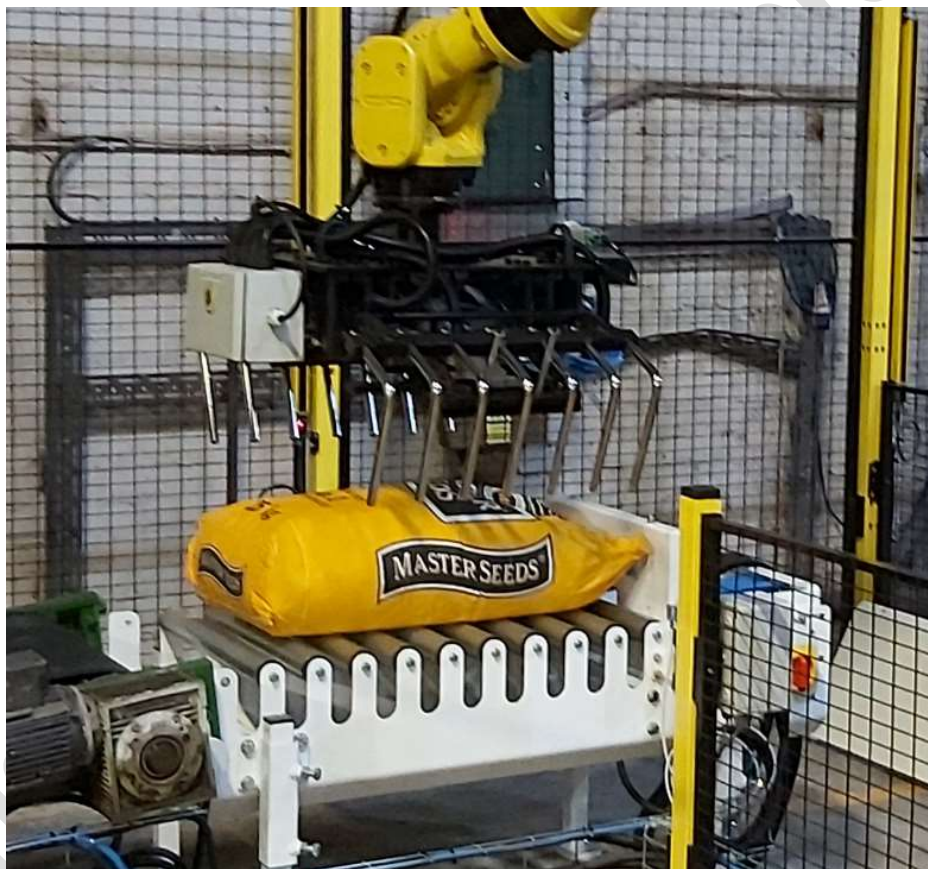
- Firstly we have the robot itself. Considerations here are for payload, envelope and cycle time. In terms of the payload this will be the maximum weight that the robot can handle. The total payload will be the weight of the product plus the weight of the gripper. The robot payload will need to be greater than the combined weight of the product and gripper. Also it will need to be borne in mind that if the centre of gravity is offset from the centre of the mounting flange this will reduce the payload capacity of the robot.



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- Fitted to the robot will be some form of gripper for picking up the product. There are different types of gripper depending on the product and the required stacking pattern. In the case of a pneumatic finger type gripper this will open around the product and have fingers that close to clamp the product to stop it moving during the movement of the robot. If this type of gripper is used consideration must be given for the stack pattern as at the moment of placing the product the gripper will open and push any product that is already palletised. Usually when using this type of gripper the product is released above it's position in order that the gripper has room to open.



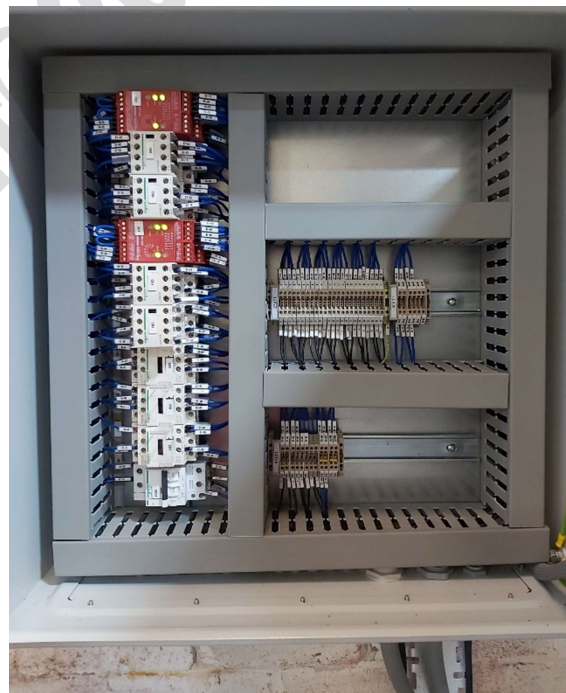
- An alternative solution is to use a vacuum system rather than fingers for picking up the product. In this case the product is held in place by an array of suckers which usually grip the product from it's upper surface. This system has the advantage that tight stacking patterns can be produced allowing the products to be placed up against product already on the pallet.

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- To control the complete cell a safety panel with cell control pushbuttons will be installed which is electrically connected to the robot controller. This panel will include the safety relays for the two safety circuits for the robot and any ancillary equipment. One circuit will be for the Estops, these will stop the robot in all modes, the other will be for the cell access and this will stop the robot and spindle whenever the robot is running in Auto mode.



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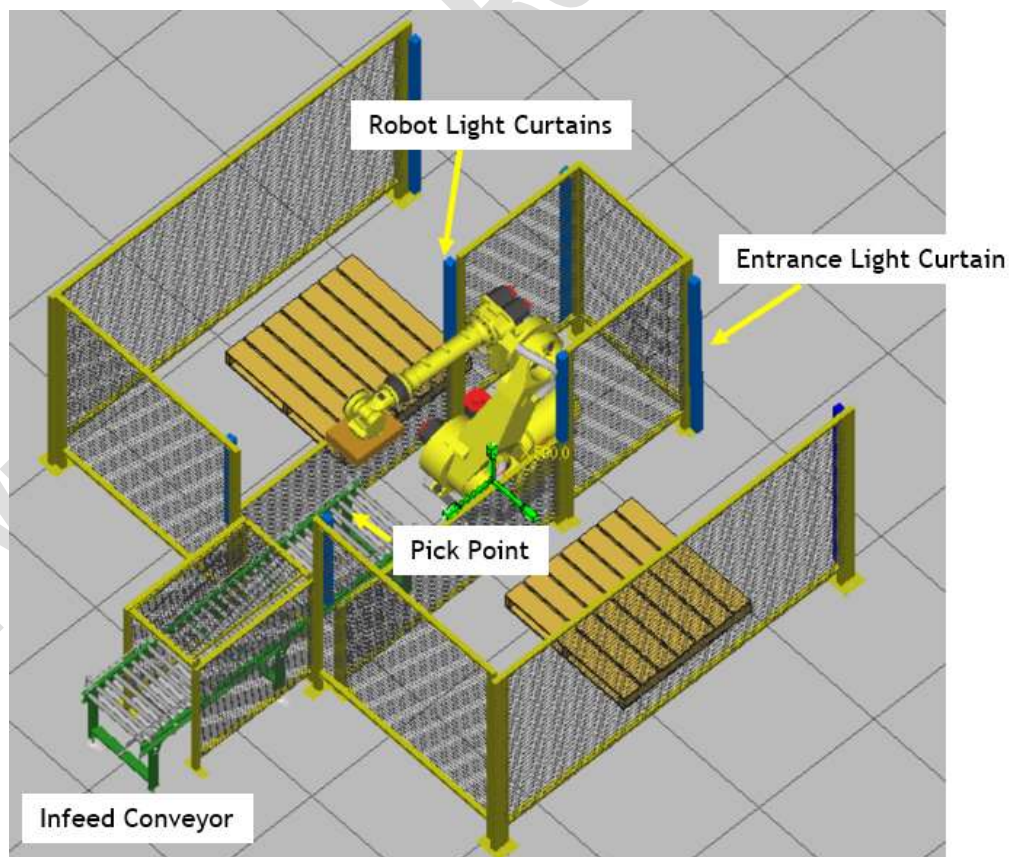
- The product will normally be delivered to one or more pickup points usually in the form of a conveyor. The management of the conveyor would normally be handled by a separate PLC to the robot as part of the machine that is manufacturing or bagging the product. The interface between the robot and the conveyor being simply a detection of the absence of the pick point being vacant with a combination of the robot clear signal and product present detection.

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- The cell will also need some form of guarding which will form a room or enclosure to make sure that nobody is present whilst the robot is working in automatic. The usual layout for a palletising cell is to have two pallet locations with the robot in the middle of the two. The robot will palletise to one side and once completed will move over to palletise the second side. Whilst the robot is working on the second pallet the first pallet is removed and replaced with a new empty pallet.

Each of the pallet stations will have two sets of light curtains to protect the operator. The front light curtain will be active and the robot side light curtain muted whilst the robot is working on that station. If the operator were to try and enter the cell the active light curtain will stop the robot. In the case of a completed pallet the operator will select to enter the station and this will activate the light curtain on the robot side and mute the light curtain at the entrance to the station allowing the operator to enter without interrupting the sequence. If for any reason the robot tries to enter the station during this time the active light curtain will detect the intrusion and stop the robot.



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Standard Cell Pricing

Materials

Robot including integrated gripper and delivery	£22,440
Robot and other equipment mounting materials	£205
Remote cell control panel enclosure and components	£427
Robot safety circuits components	£515
Guarding	£9,888
Light Curtains, mounting brackets and cabling	£15,825
Floor scanner	NA
Floor scanner protective mounting kit	NA
Cell Integration Cables	£116
Cell Trunking	£223

Material Total **£49,639**

Labour

Project Management	£388
Electrical Design	£1,045
Panel Build and Test	£1,980
Mechanical Installation Labour	£1,388
Electrical Installation Labour	£1,393
Commissioning of Robot (Robot calibration, TCP definition, User Frame definition)	£155
Commissioning of Remote Panel (IO Test)	£310
Commissioning of Light Curtains per pair (Alignment and confirmation of correct function)	£621
Initial Setup Trajectory Programming	£2,328
Production Standby (One Day)	NA
ABB Robot Programming Training (Two Days)	£1,552
Travel Time Installation Electrician	£385
Travel Time Installation Commissioning Engineer	£466

Labour Total **£12,012**

Expenses

Expenses Hotel and Daily Substance Installation Electrician and Commissioning Engineer	£2,556
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TOTAL £64,207

Exclusions

- The supply and installation of the product conveyor
- The manoeuvring of the robot and other heavy material on site

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