

# Automated Manufacture

## ASSESSMENT

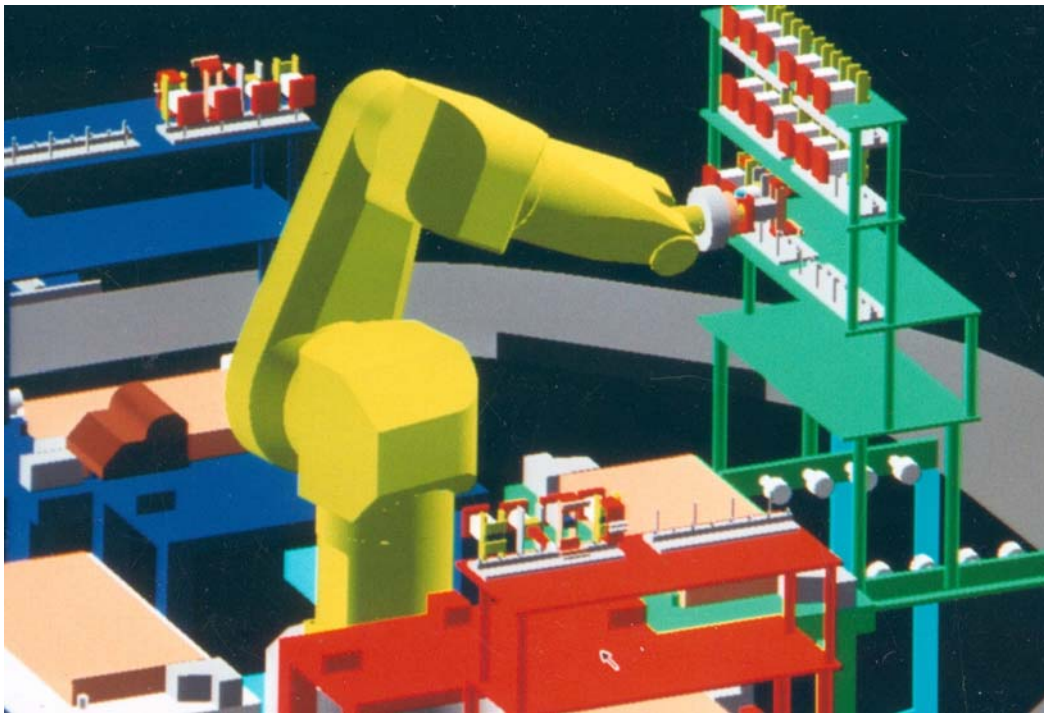
### ROBOT CELL CASE-STUDY

#### General Requirements

You are required to specify a proposed parts-feeding and sensory arrangement for the automatic assembly of a range of small gearboxes using an automatic robotic assembly cell. Supporting information for this case study, in the form of photographic and video media, are available in the study notes under “Case Study Media”.

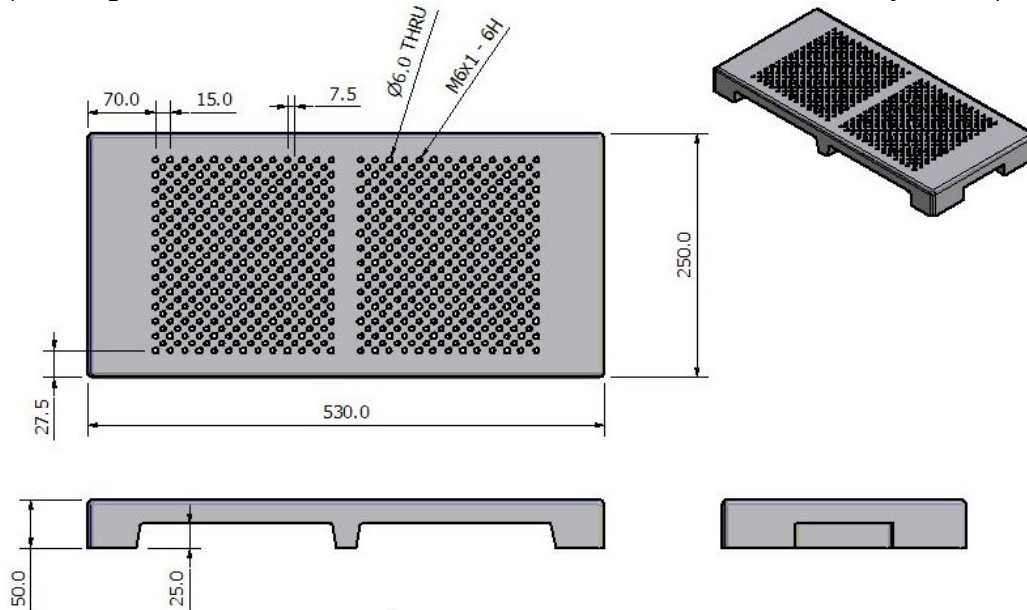
#### The Application

Currently the Flexible Assembly Cell consists of a six-axis robot arm which can pick up a range of end-effectors as shown in the computer model below:



## System Operation

Currently the system consists of a Stäubli RX 90 robot, with the ability to access three horizontal work areas to the right, front and to the left of the robot. Metal pallets with holes are used to allow fixtures to be built up using 6mm diameter pins, and parts can be added as required to make an assembly (the diagram below is also available in more detail in the case study media):-



This allows the system to be **flexible** since simply by changing the robot programme, a range of different assemblies can be made. The pallets are placed in one or more of the work areas and the robot can perform the following tasks:-

- Picking up an appropriate end-effector (gripper or tool) from a specific location
- Returning the end effector to its original location
- Picking up pins (using an appropriate end-effector) from a single supply point
- Inserting pins into holes on the pallet
- Using an appropriate end-effector to pick up, move and insert an assembly component
- Removal of a completed assembly (using an appropriate end-effector) and placing it at a specified location

## The Assemblies

The cell is required to produce a range of 3 gearboxes similar to the one shown in the case study media. Each gearbox assembly consists of a base, two gears a lid and four screws. The range of gear boxes requires only a change of gear size, the other components remaining the same.

## Assessment requirements

1. You should suggest proposed arrangements for supplying all parts automatically, (making use of appropriate feeding devices etc.). For example, how would you automatically supply the gearbox lids or the screws and what end-effectors would you use? If you consider manual loading of the pallets unsafe, an automatic method of loading should be suggested.
2. What sensors do you think are required for both operation and safety?
3. What overall control strategy would you apply and what control devices would you suggest?
4. Suggest a way of making the cell safe for human operators working nearby and to ensure that maintenance can be carried out without exposing personnel to damage or hazard.
5. In each case you should, where possible, refer to actual devices and sensors that are available to industry, quoting manufacturer's details.
6. Note that there is no single answer to this exercise as there are numerous ways to automate a system. You should, therefore, explain why you have suggested a particular arrangement and supply evidence to support your reasoning.