



MACHINERY AUTOMATION & ROBOTICS

When the outcome has to be certain!



Increasing TPM³ Values

Triple Robot Palletiser, Twin Shuttle and Strapping, Wrapping System

Case Study

*VIP Packaging Villawood
Sydney NSW*



CTPM
Australasia



Presentation Outline

- Overview of Machinery Automation Robotics
- Overview of VIP Packaging Australia – Villawood Plant Sydney
- Overview of Project and outcome
- Initial Factory Acceptance Test
- Robot Palletiser Video
- “TPM³ Friendly” Objectives
- “TPM³ Friendly” Improvements , Achievements
- Learning's
- Questions



Why MAR?

What sets us apart?

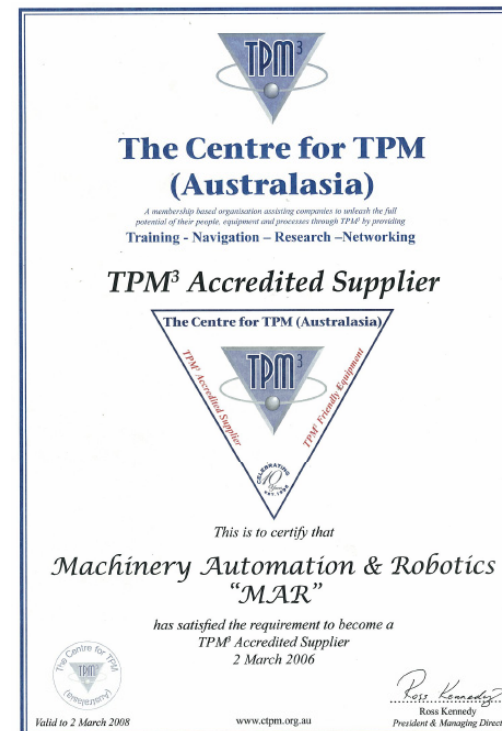
25yrs - Local company with international experience

- 70+ Staff in offices across Australia
- We know automation and robotics



CTPM Australasia & MAR

- Member since 2006
- Certificate presented at TPM³ Forum in March 2006 - Rotorua
- Allows us to better understand our customers needs.
- Good framework for us to look at self improvement.



MAR Accreditations



2008 Telstra Australian
Business Of The Year



Why MAR?

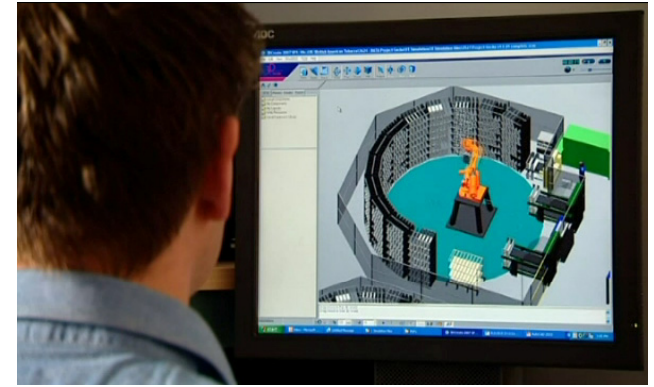
What we do?

- Complete turn-key automation solutions designed for your needs
- Solutions fully tested at our facilities to ensure minimum downtime
- Dedicated Project Manager for the duration of the project
- 24hr / 7 day service & breakdown support with **guaranteed** 1hr response
- Best of breed technologies



Consulting & Front End Engineering

- Front end engineering typically occurs following feasibility and prior to project commencement, and sets the course for the remainder of the project
- MAR can provide front end engineering and consultation services to give your project solid foundations and help successfully meet project objectives, including:
 - Time requirements
 - ROI
 - Operating costs & budget
 - Initial system design & layouts



Improve productivity through automation

- Sorting Systems
- Robotic Palletising
- Conveyor Automation
- Robotic Welding
- Materials Handling
- Vision Systems
- Red Meat Industry
- PLC/HMI Controls
- Servo Systems



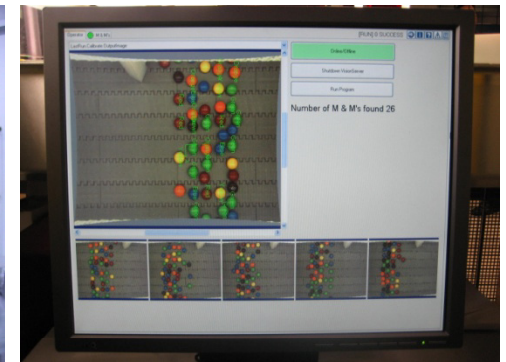
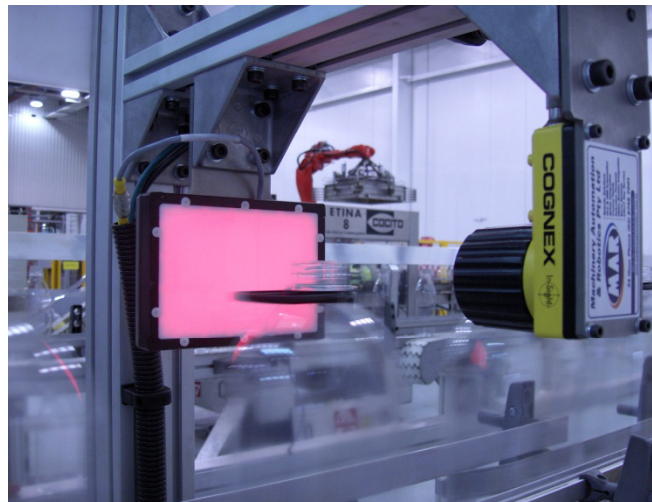
Improve productivity through automation

- Sortation Systems
- Robotic Palletising
- Conveyor Automation
- Robotic Welding
- Materials Handling
- Vision Systems
- Red Meat Industry
- PLC/HMI Controls
- Servo Systems



Machine Vision

- Recognised integrator for 2D and 3D vision systems nationwide
- MAR has the expertise to:
 - Integrate a vision system into your existing production space or
 - Provide a complete automation solution specifically tailored to your needs



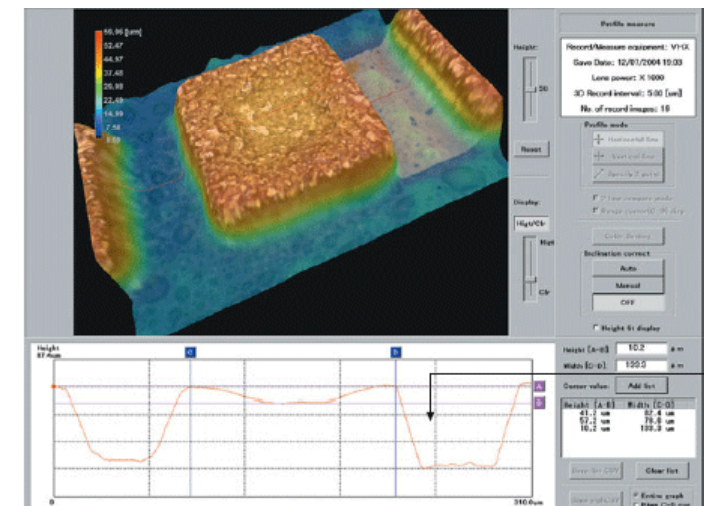
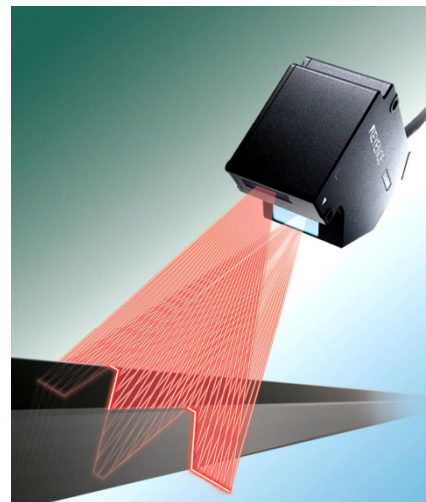
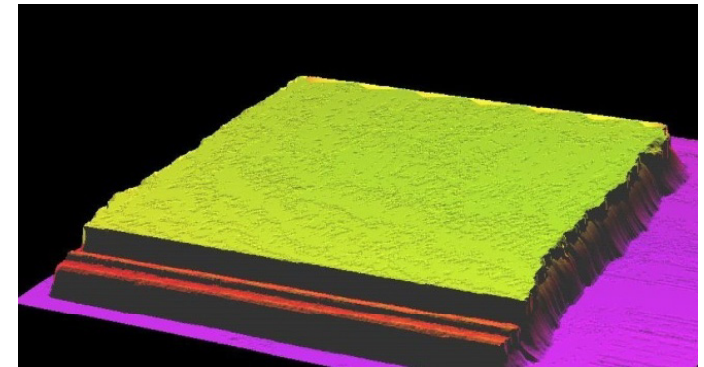
Machine Vision

- MAR's Automated vision inspection systems
 - Highly accurate
 - Suitable for high and low speed lines



Sensing

- Laser sensing
- Stereo vision & 3D imaging
- X-Ray & CT scanning



PLC Programming

- With accreditation from major PLC suppliers including Rockwell Automation (AB), Siemens and Omron, MAR has the in-house expertise for the most complex PLC breakdown, service, upgrade or turnkey integration project
- PLC system capabilities include
 - Allen Bradley
 - Siemens
 - Omron
 - Texas
 - Hitachi
 - Square D
 - Mitsubishi
 - Toshiba
 - Izumi
 - Modicon



Process Automation

- Full PLC automation
- Touch screen HMI's
- Ethernet communications
- DeviceNet to all drives
- DeviceNet to all I/O
- Safety on bus configuration
- EMC compliance



Safety Integration

- Providing electrical and mechanical safeguarding integration for machines.
 - Turn-key solution
 - Compliant with Australian Standards
 - Machine Design or Upgrade stage
 - Risk Assessment
 - Installation, testing & commissioning

- MAR is a fully accredited integrator for all major safety suppliers including:
 - Rockwell / AB
 - SICK / Siemens
 - Omron
 - Pilz



Documentation

- Development of functional specification
 - System process engineering
 - CAD Drawings
 - Fully documented PLC programs
 - Data security from CD copy and MAR server backup
 - Fully documented site specific manuals
 - On-site training



Workshop & test facilities

- MAR's state of the art facilities have been purpose built, allowing us to design, manufacture and test customer solutions in a dedicated environment
- The facilities include:
 - Fully equipped workshop
 - Fully equipped test room
 - Separate robotic facilities
 - Robotic PLC & vision training facility



Why MAR?

What sets us apart?

Innovation & Support

- Outstanding support and technical innovation is what sets us apart from others
- Major R&D focus – 5% of revenue goes back into R&D



Why MAR?

What sets us apart?

Experience & Knowledge

- Automation & robotic solutions and support for major Australian and international companies, including:
 - Bluescope Steel
 - Boeing Aerospace
 - Inghams
 - CSR Bricks and Roofing
 - Qantas
 - George Western Foods
 - Goodman Fielder
 - BOC Linde Group
- We constantly train and educate our staff to ensure they have knowledge and experience in the latest technologies and systems



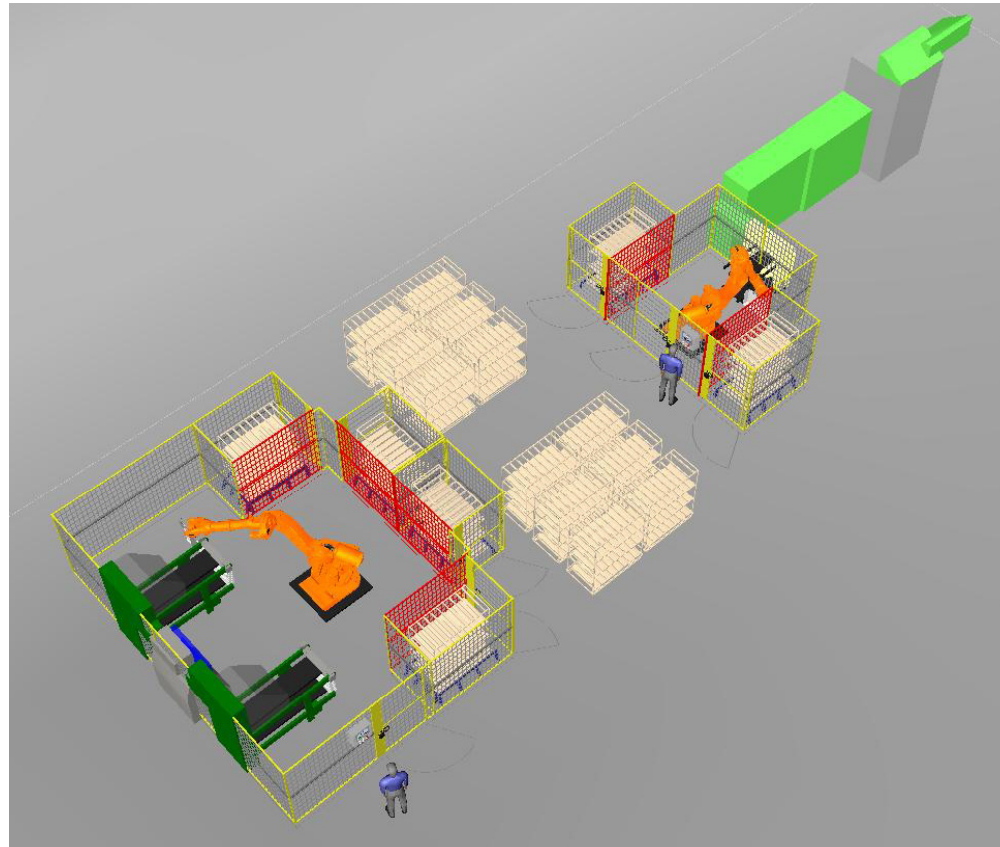
Technology Partners



Project Example

Concept Development Phase

- Conceptual design using 3D simulation
- Drawings created and expanded into simulations



Project Example

Proof of Concept

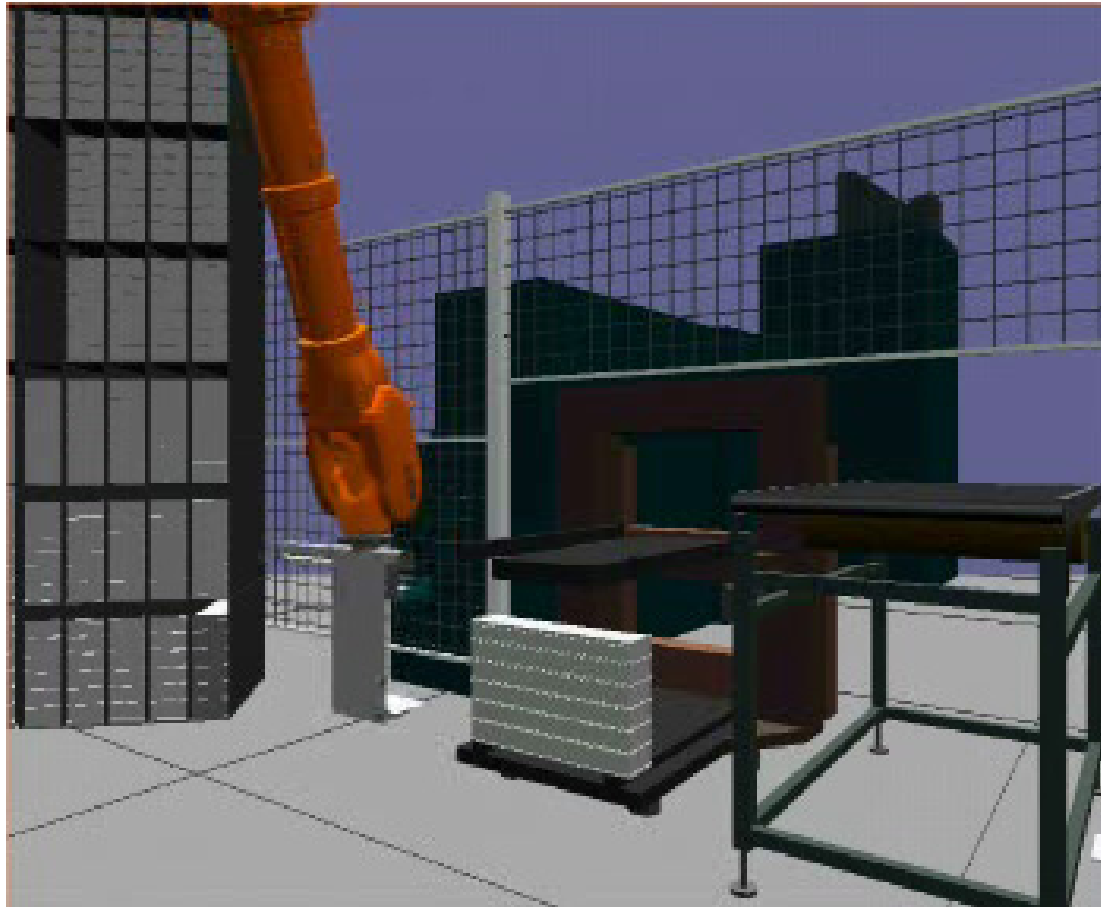
- [Preliminary proof of concept with client at MAR](#)



Project Example

Concept Development Phase 2

- [Full 3D simulation following MAR design review](#)



Project Example

Factory Acceptance Testing at MAR

- [Factory Acceptance Testing at MAR](#)



Project Example

Operational

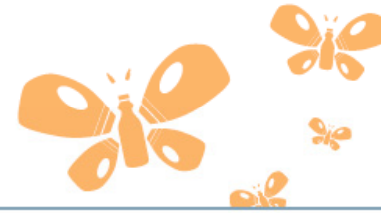




VIP Packaging

PLASTIC BOTTLES & JARS

PET, LDPE, HDPE, PP



The Clear Choice

VIP Packaging offers a wide range of stock and custom made plastic bottles and jars, from injection stretch blow moulded PET or PP to extrusion blow moulded LDPE, HDPE and PP containers.

Whatever shape your brand takes, VIP Packaging's in-house design teams can match your current design or create a quality package that is unique, innovative, practical and cost-

effective. These materials are collected in Kerbside Recycling Systems and can be designed to suit your filling lines and stack in the most efficient, space saving way.

VIP Packaging also has an extensive stock range of bottles and jars as well as a variety of stock and custom made closures to add that finishing touch to your package.





VIP Packaging





VIP Packaging

- Blow moulding plastic bottles
- Palletising & Strapping
- Bidding on a new contract
- Automation to reduce cost of manufacturing
- New Equipment
- Chose MAR Solution
- Merv Shirazi – Senior PM





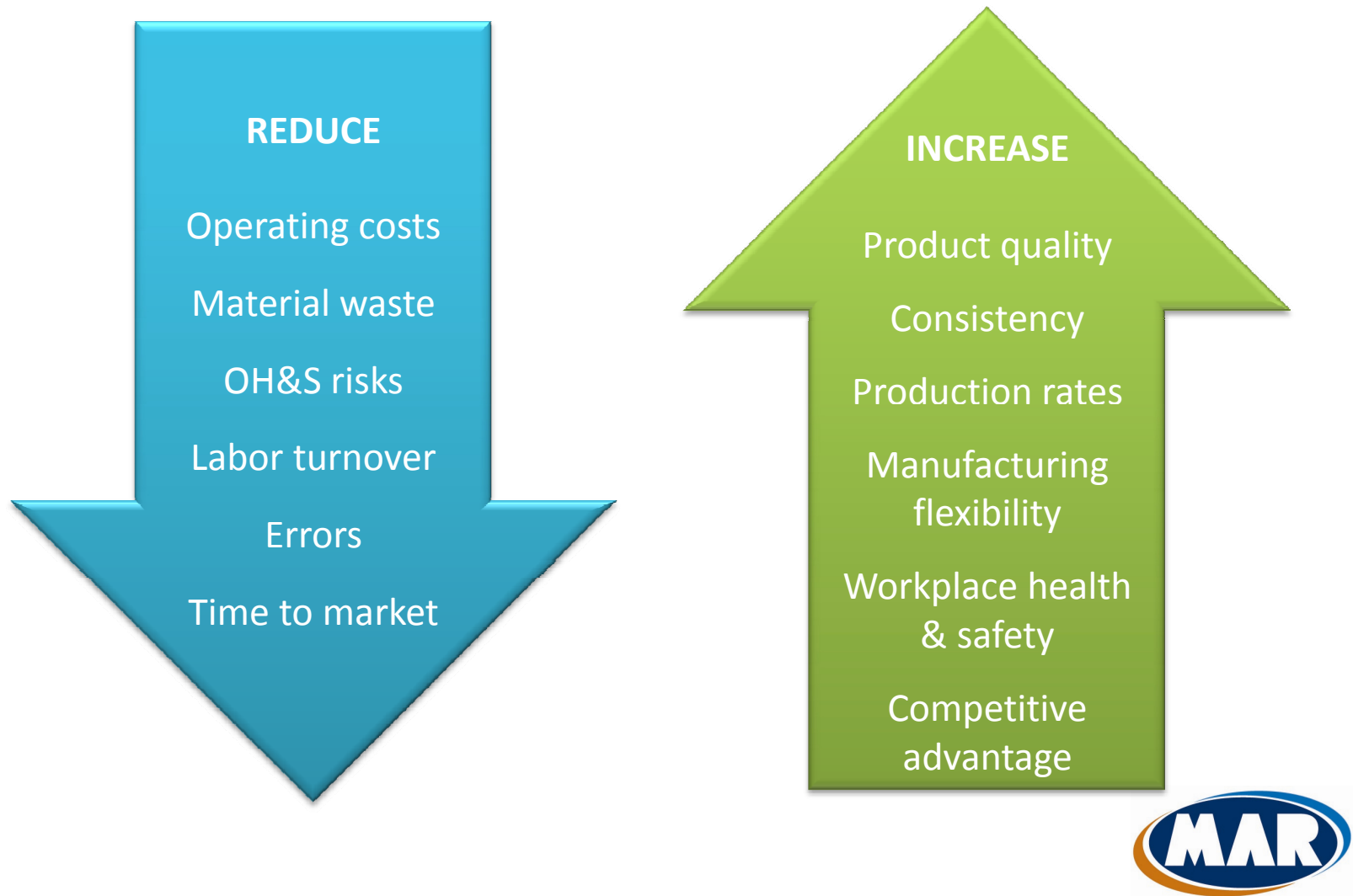
VIP Packaging

Why VIP needs to implement this project:

1. Current Process is slow – TIME, DEADLINES
2. Current Process is expensive - COST
3. Current Process quality control is low - QUALITY
4. OH&S issues – SAFETY
5. Better work area management – WORK SPACE
6. Minimize Maintenance – COST, LESS DOWNTIME



Why choose Automation?



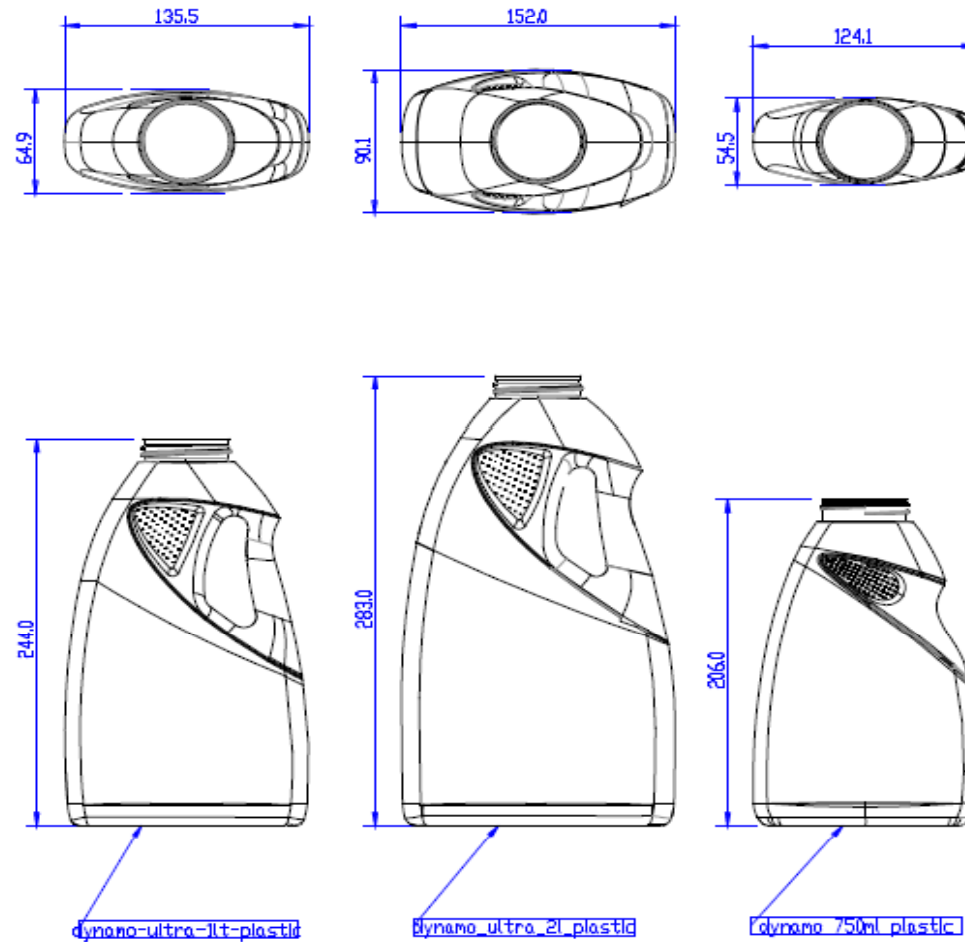


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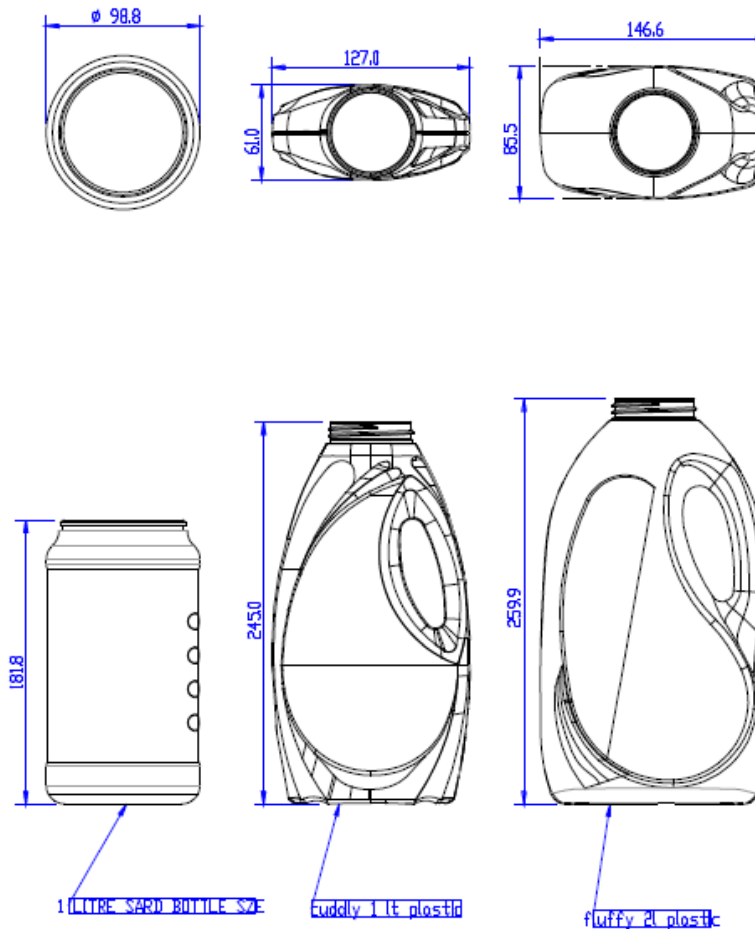


VIP Packaging





VIP Packaging



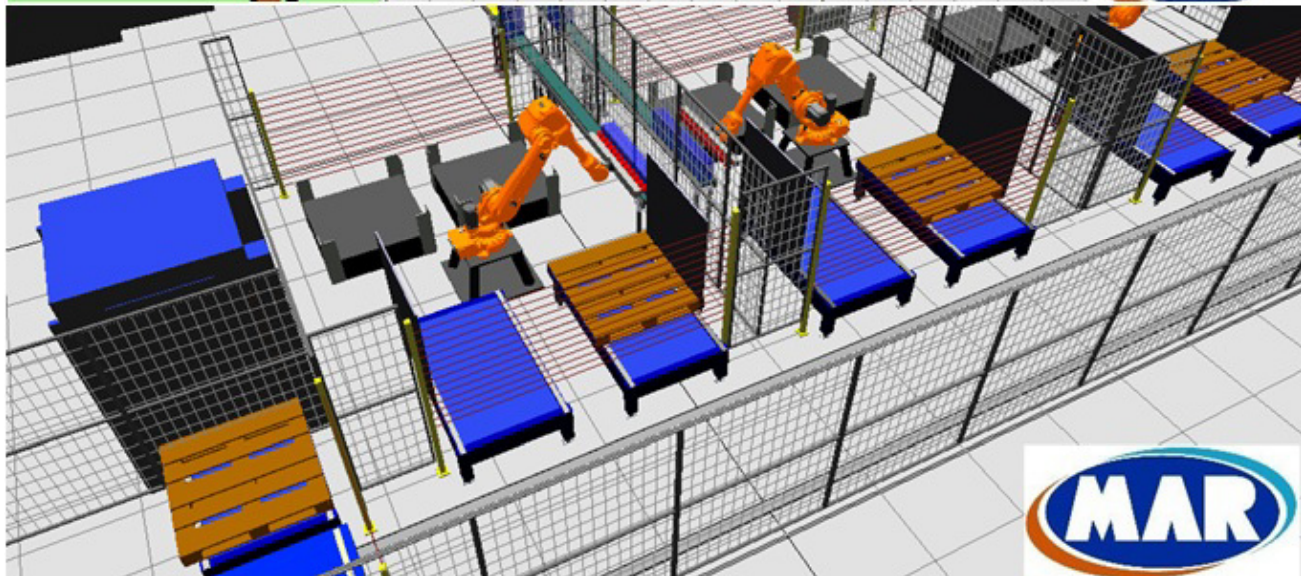
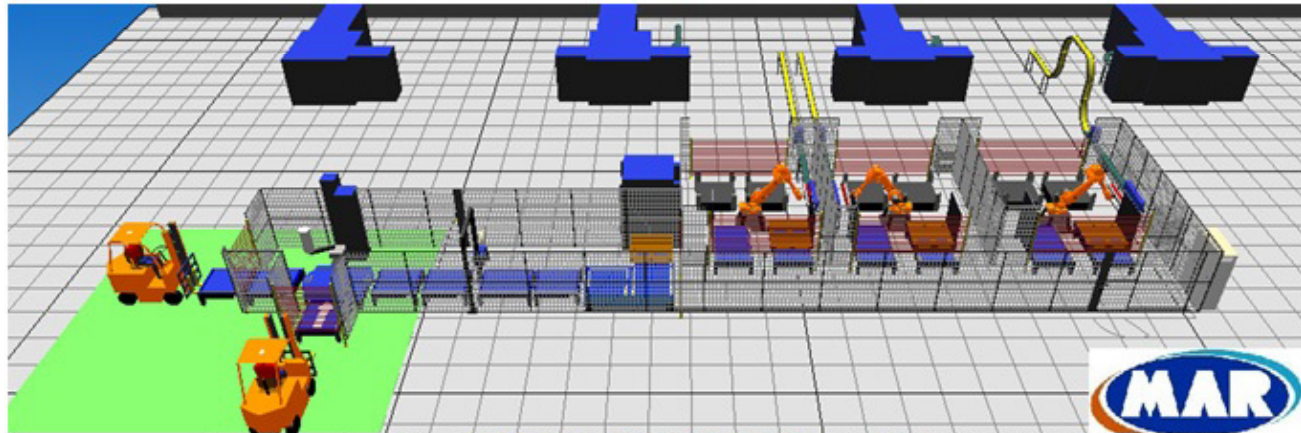


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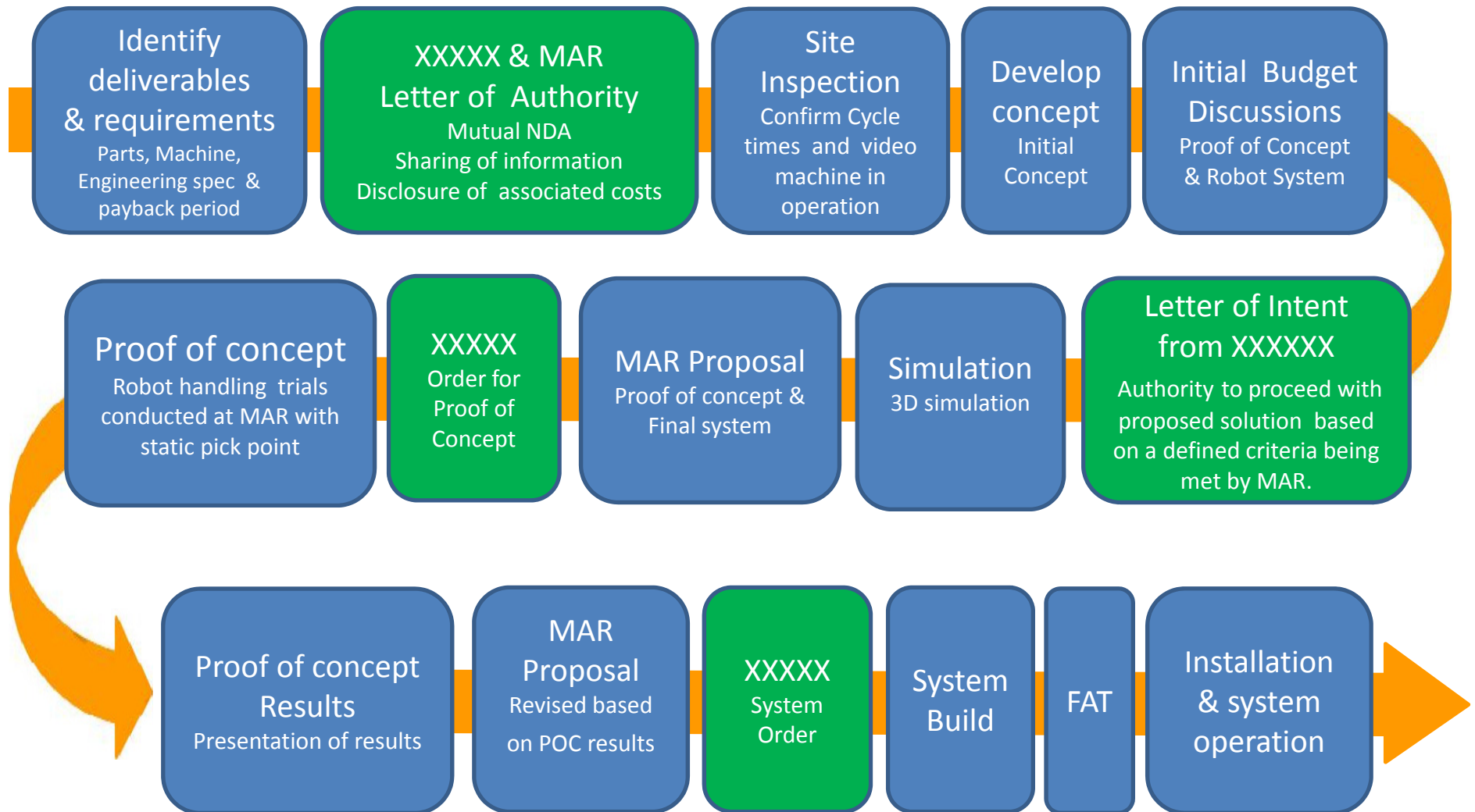




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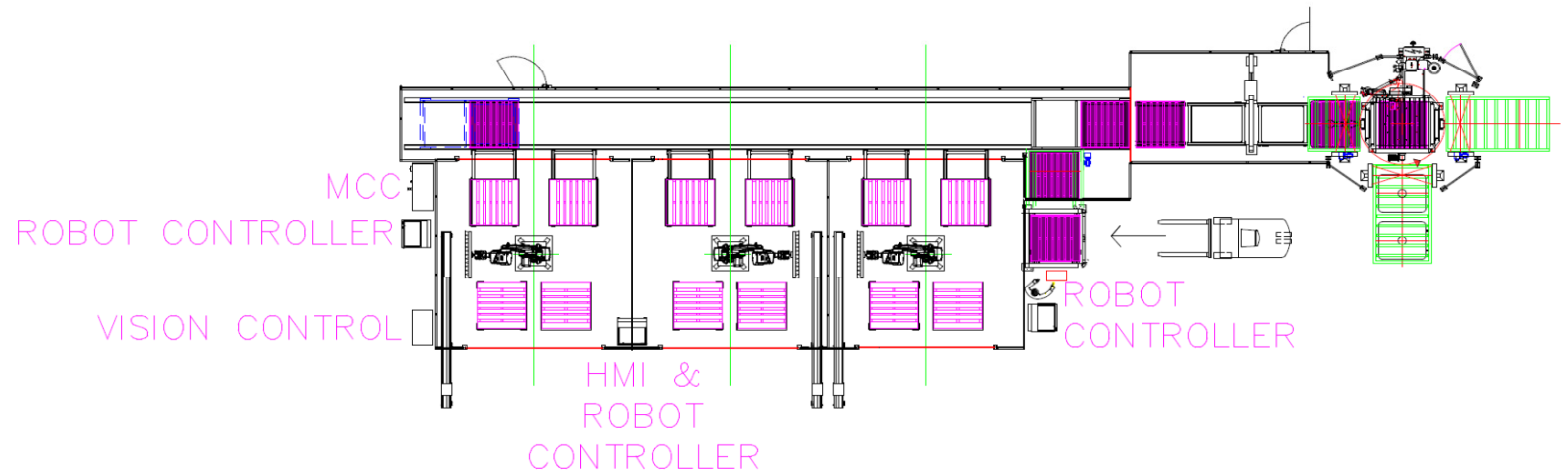


Typical Project Stages





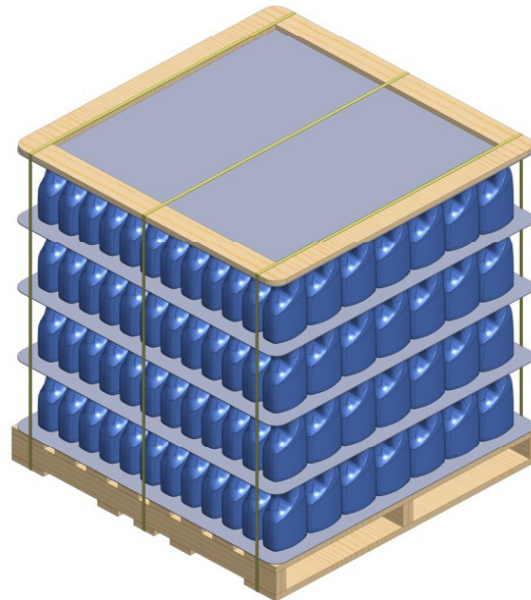
VIP Packaging





VIP Packaging

Product	Bottles Per Row	Bottles per Layer	Layers	Products per Pallet	Maximum height (mm)
Dynamo - 1L	8	136	4	544	1165
Dynamo - 2L	7	84	4	336	1295
Dynamo – 750ml	11	209	6	1254	1264
Sard – 1L	11	132	6	792	1265
RTU – 1L	9	162	4	648	1165
Fluffy - 2L	7	91	4	364	1080





VIP Packaging

Product	Line	Products per Pallet	Max Rate Per hr	Pallets per Hour
Dynamo - 1L	P06	544	2200	4
Dynamo - 2L	P07	336	1500	4.4
Dynamo – 1L	P07	544	2200	4
Dynamo – 750ml	P22	1254	1662	3
Sard – 1L	P22	858	2200	2.5
RTU – 1L	P22	648	1440	2.2
Fluffy - 2L	P22	364	1200	3.2





VIP Packaging

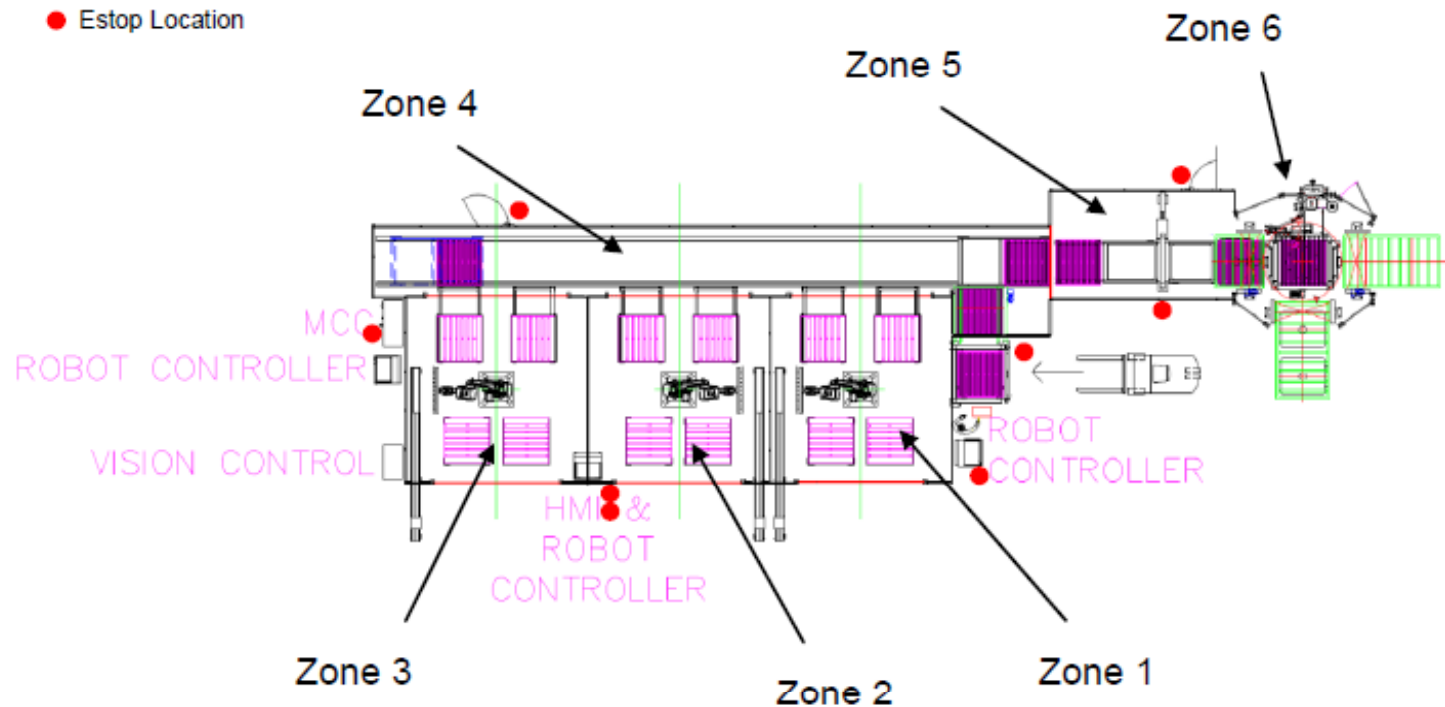
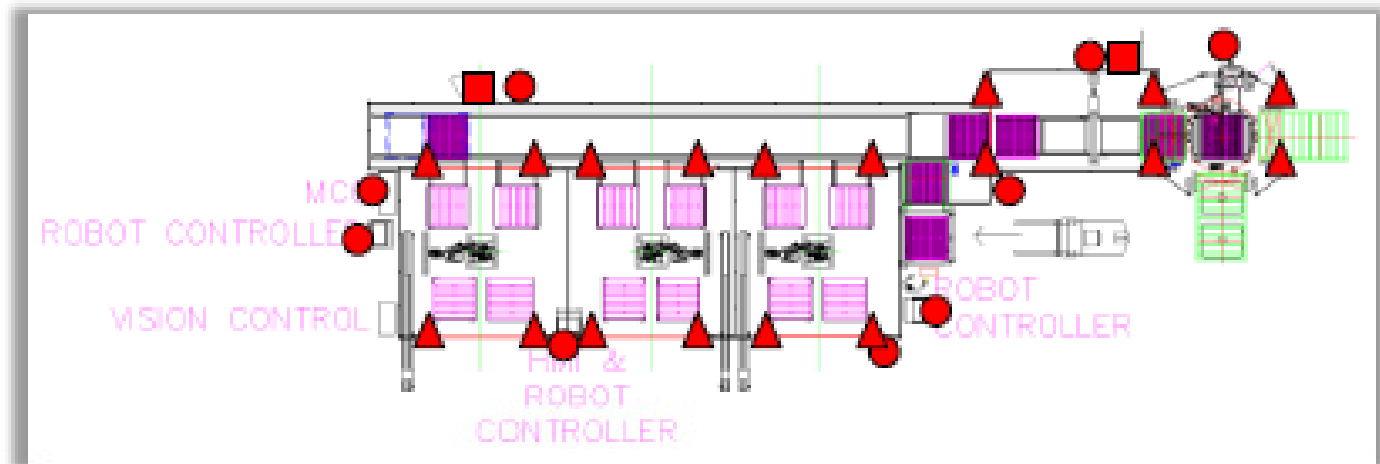


Figure 16 Safety Zones





VIP Packaging



- = Access Gate switch
- = Emergency Stop Button
- ▲ = Light Curtain

Figure 13 – Safety device locations





VIP Packaging

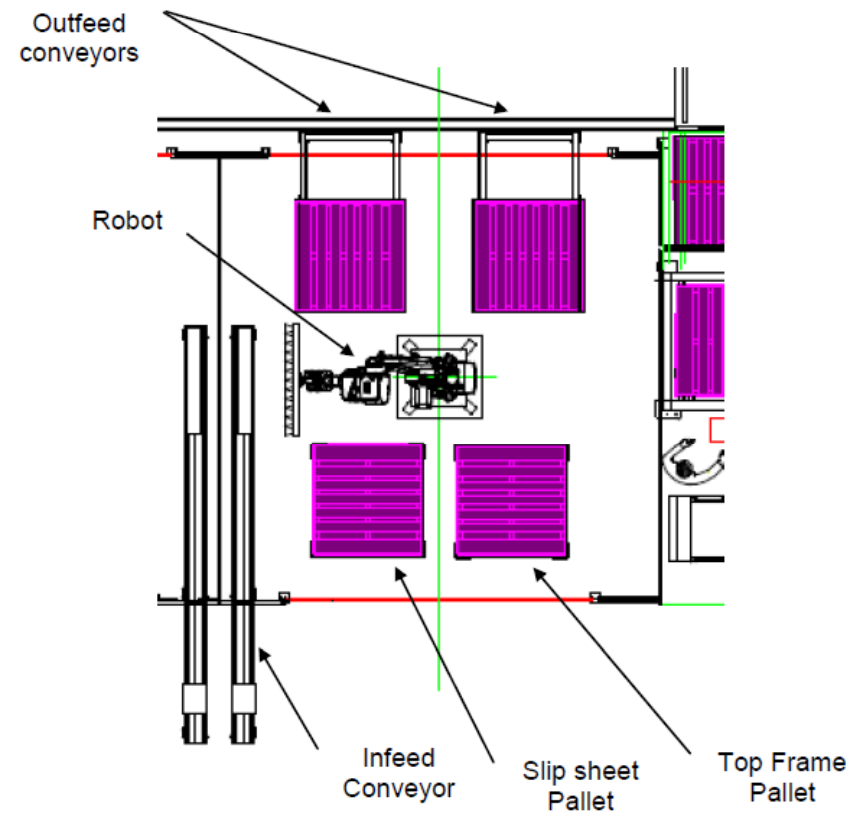


Figure 7 Robot Cell Layout





VIP Packaging

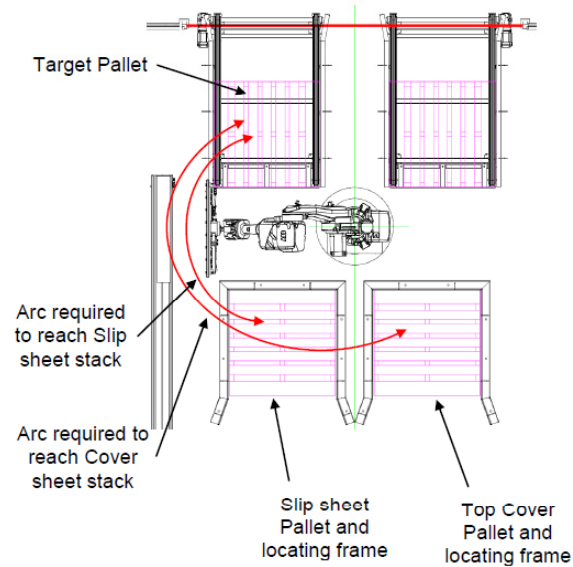


Figure 13 Preferred Positions of Slip Sheet/Top Cover Locating Frames

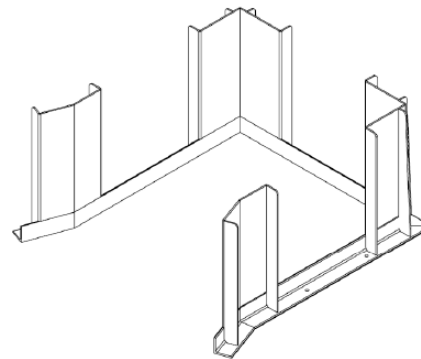


Figure 14 Slip Sheet/Top Cover Locating Detail





VIP Packaging

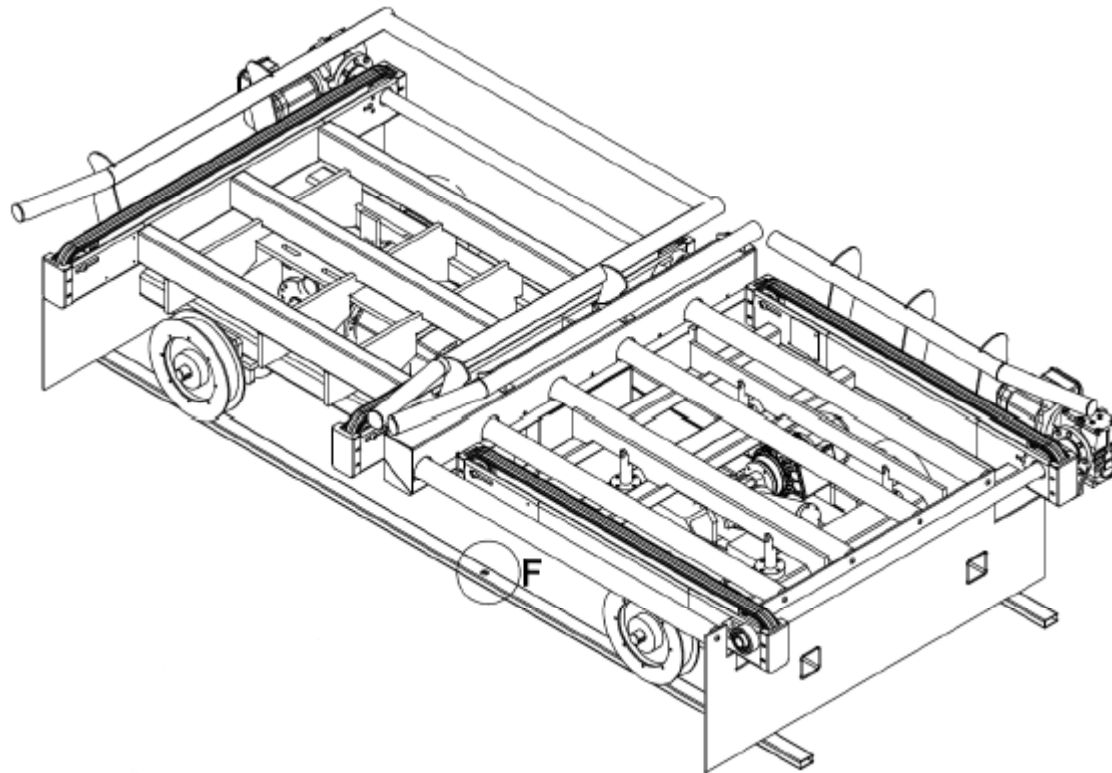


Figure 25 Shuttle Detail





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Figure 28 Pallet Strapper





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Figure 8 Robot, Controller, and Pendant





VIP Packaging



Figure 9 – Master Air Supply Isolation



Figure 10 – Pallet Dispenser Air Supply Isolation



Figure 11 – Robot Cell Air Supply Isolation



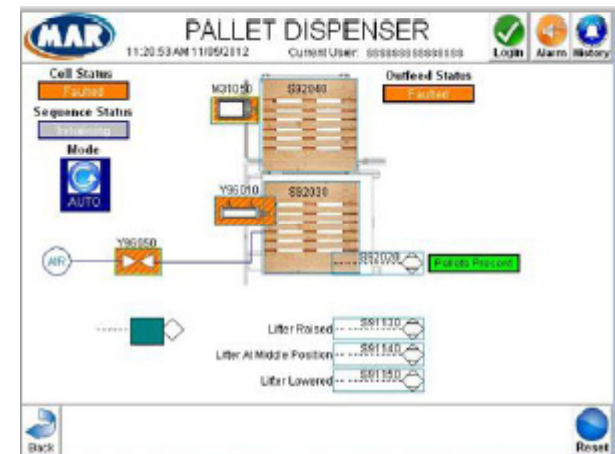


VIP Packaging





VIP Packaging





VIP Packaging

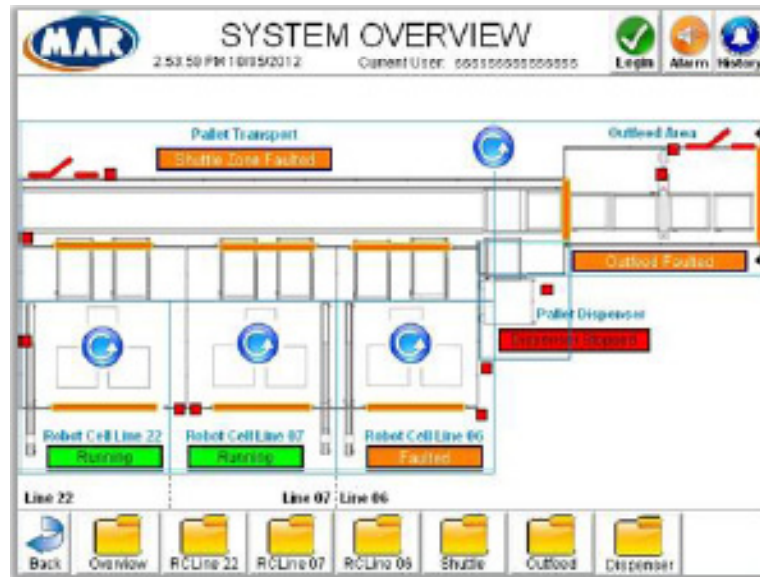


Figure 14 – HMI safety indication

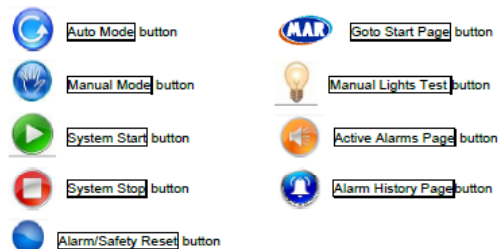
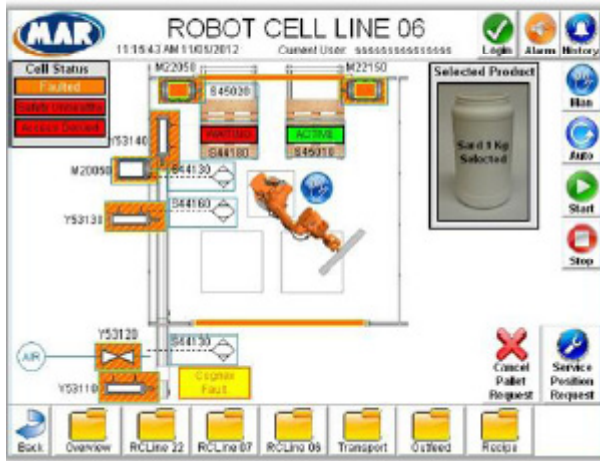


Figure 16 – Start up Screen







PRODUCT SELECTION

11:20:53 AM 11/05/2012 Current User: sssssssssssssss

 Login
  Admin
  History

					
Dynamo 2 Litre	Dynamo 1 Litre	Dynamo 750ml	Fluffy 1 Litre	Cuddly 1 Litre	Sard 1 Kg

Selected Product



Sard 1 Kg
Selected

 Back

SHUTTLE ZONE

11:18:51 AM 11/05/2012 Current User: sss sss sss sss sss sss


Shuttle Zone Status
 Current Faulted
 No Fault Found

M20010 Position of Shuttle M20010 mm **Position**

SHUTTLE CAR

PALLE DISPENSER


Back Overview RC Line 22 RC Line 07 RC Line 08 Shuttle Outfeed





SHUTTLE CAR


11:22:35 AM 11/05/2012

Current User: 8585858585858585



Login



Alarm



History



The diagram shows a top-down view of the shuttle car with two main sections: a wooden pallet area on the left and a grey floor area on the right. Various sensors are indicated by labels and dashed lines: M20050, S42130, M20050, S42140, M31150, S42170, S42180, S42190, and S42160. A 'Raised' and 'Lowered' status indicator is shown on the right.


 S42190
 Conveyor
 Aligned with
 Empty Pallet
 Transfer


 S42160
 Conveyor
 Aligned with
 Full Pallet
 Transfer


Back

Slide 51



VIP Packaging

12.3 System Start-up

After the air and power are on the following steps should be taken to start the system in production. Each robot cell is controlled individually and must be started as such. The pallet shuttle and strapper areas will start automatically when any one of the robot cells is started, provided their safety circuit is healthy and in Auto mode.

1. Ensure the air and power is on for all devices.



2. Reset the shuttle area and strapper area safety via the blue reset button at their respective access gates ensuring no personnel or foreign objects are present inside the perimeter guarding (the wrapper safety light curtain will need to be reset and healthy before the strapper area can be deemed safe, refer to wrapper operation manual for more information).





VIP Packaging

3. Ensure pallet dispenser is loaded with pallets, and then switch to auto mode using the switch on the operator console adjacent to the pallet dispenser. Press **Dispense** pushbutton to start operation.



4. Put the robot cell/s into **Auto Mode** from the **Robot Cell** screen.



5. Put the robot into Production (Auto) Mode via the key switch.



6. Check that the correct product is selected.
7. Press the **System Start** button operator control station or the HMI **Robot Cell** screen.
8. If the robot program has been reset via "PP to Main" the operator will be prompted at the robot teach pendant to confirm the robot is able to move safely to the HOME position.
9. If the gripper arms are extended the operator will be prompted to confirm that it is clear and safe to retract the arms before moving to the HOME position.



10. Check that the robot is able to move vertically upwards safely without obstruction and press the YES button on the robot teach pendant.
11. The robot will return to the HOME position.





VIP Packaging

12. If the robot program has not been reset, the robot will continue from where it currently rests.
13. When one of the robot cells is started, assuming safety zones are healthy, the shuttle conveyor and outfeed zones will start automatically. Operators must ensure that the pallet dispenser is not left in the manual state via the local control station and that the pallet dispense button is pressed to restart the system in auto after a fault or change to manual state.



12.4 Entering the Shuttle Zone or Pallet Strapper Zone via the Rear Gates

To enter these zones for any reason:

1. Press the white Cell Entry Request button at the gate you wish to enter.



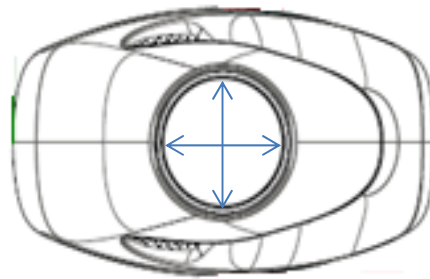


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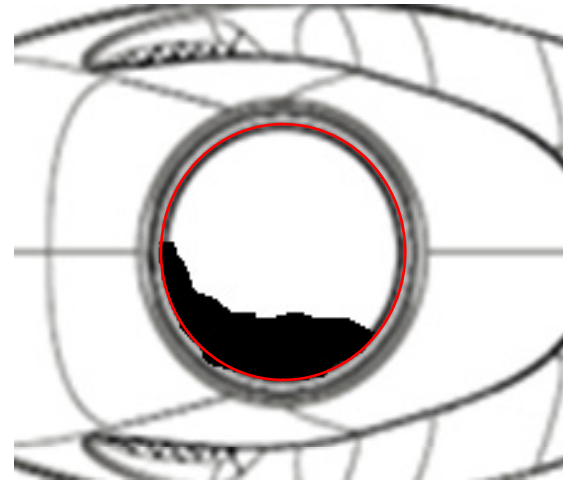




VIP Packaging



Ovality measured as difference between major and minor axes



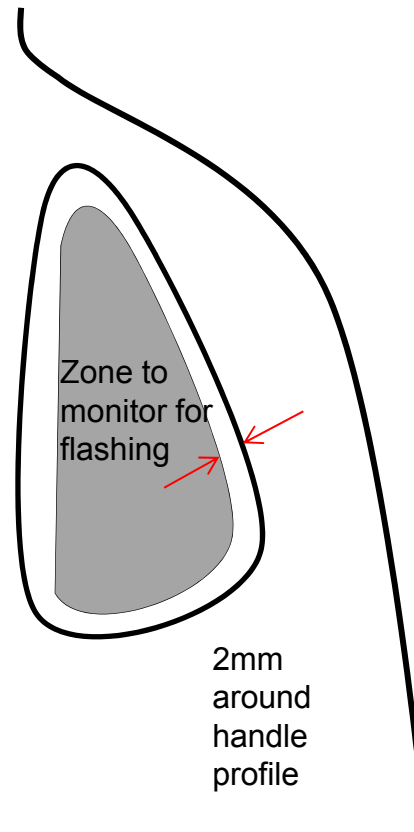
Neck Flashing measured as area protruding past best fit circle

Quantity Measured	Units	Minimum Performance
Maximum Inspection Rate	bottles/hour	2200
Neck out of round (Neck Ø < 40mm)	mm	0.8
Neck out of round (Neck Ø > 40mm)	mm	1.2
Neck Flashing	mm ²	25





VIP Packaging

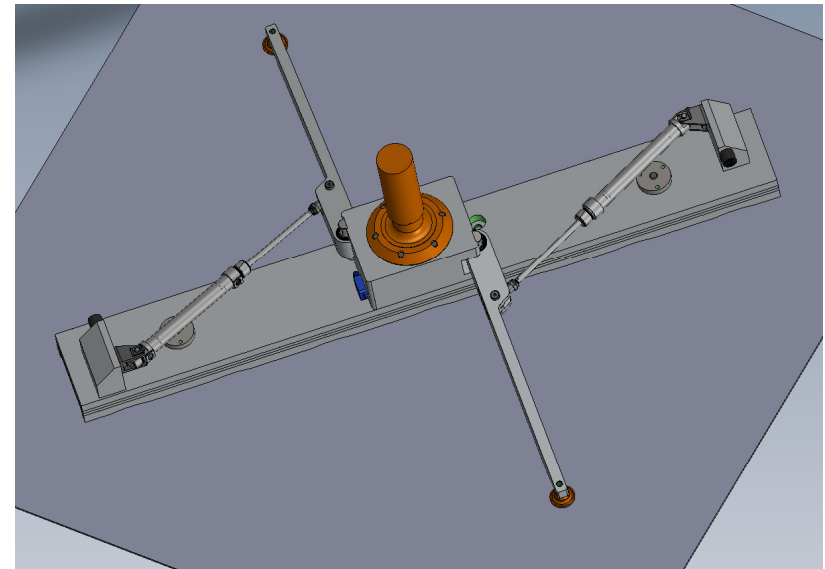
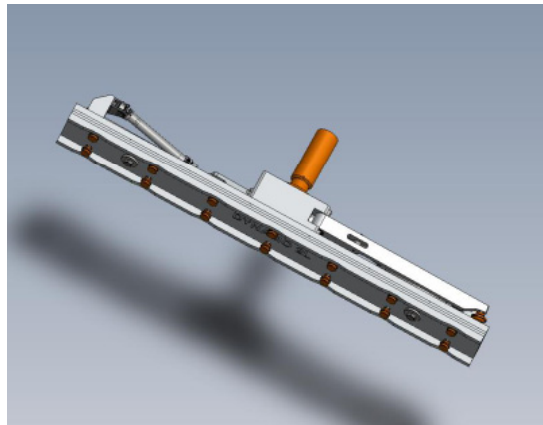
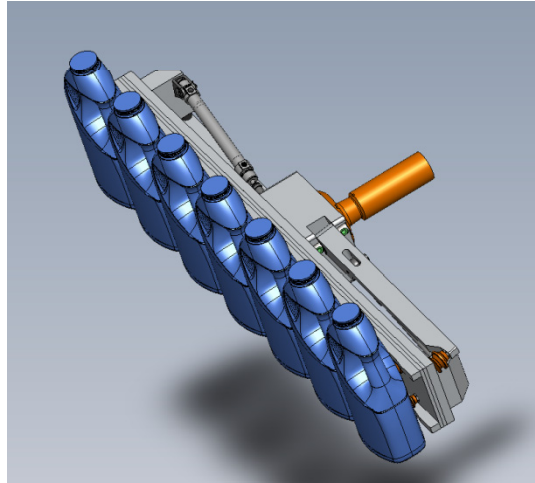


Quantity Measured	Units	Minimum Performance
Maximum Inspection Rate	bottles/hour	2200
Handle Flashing	mm ² protruding into monitored zone	100





VIP Packaging





VIP Packaging





VIP Packaging



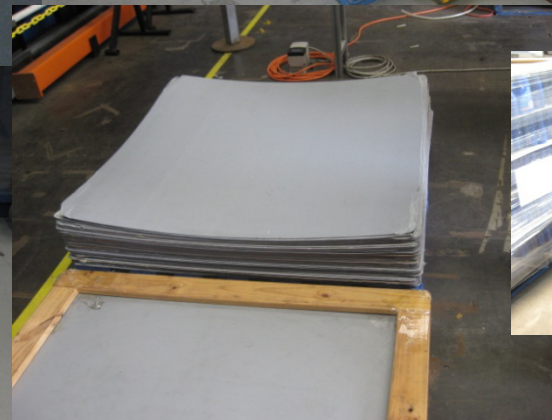


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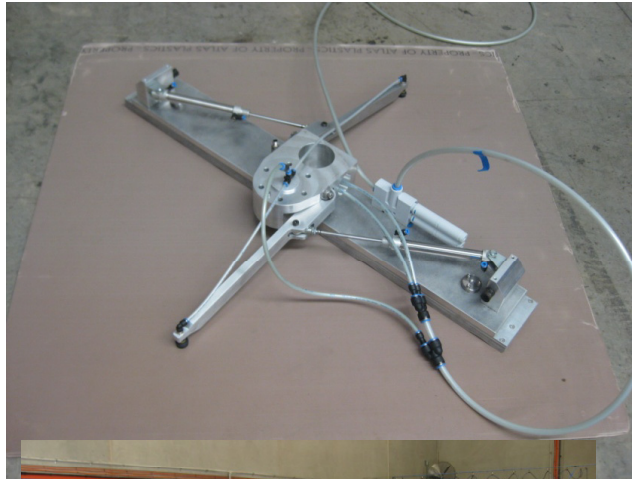


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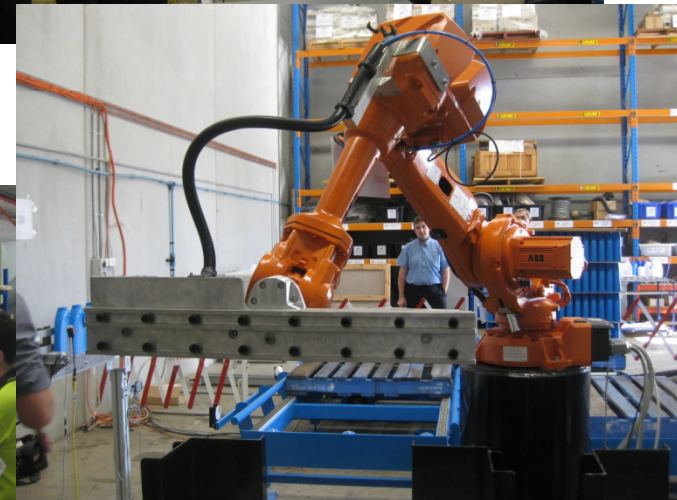


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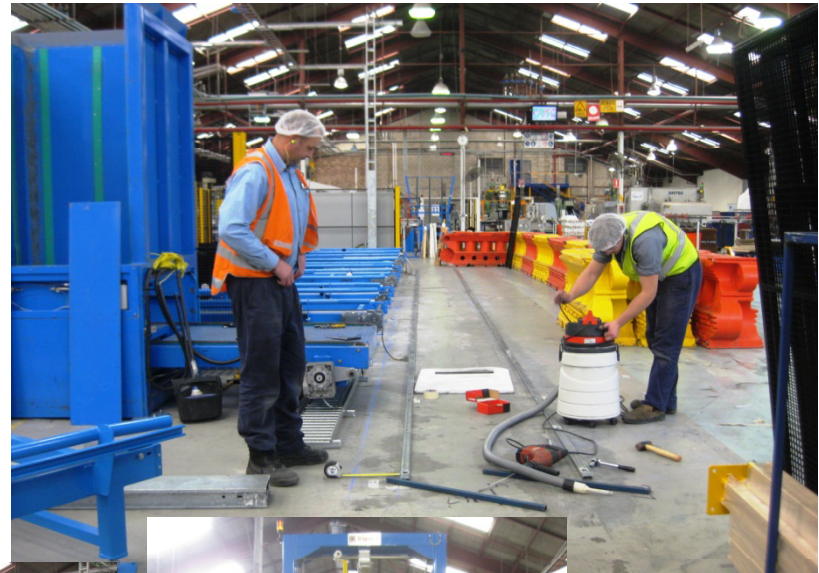
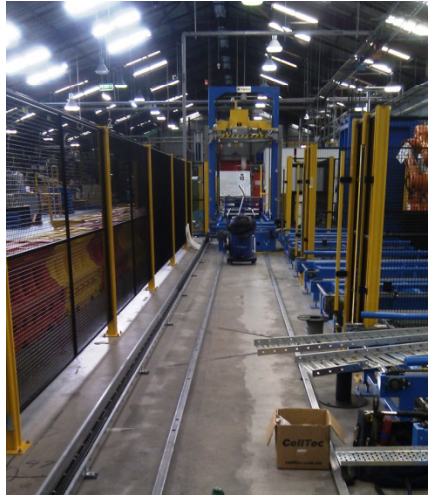


VIP Packaging





VIP Packaging





VIP Packaging





VIP Packaging





VIP Packaging





VIP Packaging





VIP Packaging

VIDEO 1

VIDEO 2

VIDEO 3



The Objectives of New Equipment Management (NEM)

To apply the TPM³ field experience gained through



to new equipment / product designs so as to

minimise the Life Cycle Cost

through

Prevention at Source Design Activities



What do you need to consider to improve Life Cycle Cost?

Operability:

Aim: Make it easy to do right and difficult to do wrong:

Example: *Built in Quality through automatic stops & Mistake Proofing (Jidoka)*

Maintainability:

Aim: Try to eliminate maintenance or to make it easy, infrequent and low cost:

Example: *Automatic lubricating systems ?*

Standardisation:

Aim: Minimise spare parts, consumables, and especially training costs:

Example: *Standardisation of plant & equipment identification*



What is “TPM³ Friendly” Plant & Equipment?

Making plant & equipment so it is easy for:

Operators to identify **process and quality problems at the earliest possible time** - *“Tyranny of Time in addressing problem”*

Operators to identify **equipment condition abnormalities** (*Equipment Defects*) – *“Prevention at Source for Equipment”*



Acceptance Testing

Acceptance Testing consists of four Steps:

- 1. *Factory Acceptance Testing*** – performed before equipment is shipped to identify any design and manufacturing failings
- 2. *Testing Upon Receipt*** – performed after delivery but before the equipment is signed off to ensure the shipment has arrived intact and not damaged.
- 3. *Installation Acceptance Testing*** – performed immediately after installation to identify installation errors
- 4. *Start-Up & Commissioning Testing*** – the initial start-up, performing all functions of the equipment. Running equipment to the required production conditions and speeds.





VIP Packaging - Leanings

- **Routine Design and Risk Review with client helped to minimised mistakes.**
- **Involvement of cross functional teams from both sides been very helpful.**
- **Factory Acceptance Testing with cross functional team**
- **Training of operation team due to different shifts took some times, not enough skills from operation side**
- **Cleaning & Inspection: VIP to frequently organise and clean the area**





VIP Packaging - Achievements

- Increased Operation Safety
- Increased Process Quality
- Increased Process Speed
- Participation of Cross Functional Team in the project and ownership (operation, maintenance, OH&S, management, ...)
- Increased work area management, less space and cleaner and more organized work place
- Less maintenance, less spare parts, easy maintenance, preventive maintenance
- Overall decreasing cost of manufacturing



Questions

Thank you for your time

