

AJAY KUMAR GARG ENGINEERING COLLEGE, GHAZIABAD



IIOT BASED INTEGRATED PACKAGING SYSTEMS

Presented By: -

TEAM INNOVATORS

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- Inspection in manufacturing is conducting inspection during the production process. This approach of inspection helps us to control the quality of products by helping to fix the sources of defects immediately after they are detected, and it is useful for any factory that wants to **improve productivity**, reduce defect rates, and reduce re-work and waste.
- A package should be designed to make it easy to transport, move and lift. A regular shaped package (such as a cuboids) can be stacked without too much space between each package being wasted. This means that more packages can be transported in a container of a lorry. Unusually shaped packages can lead to space being **wasted** and this can be costly if thousands of the same package are been transported.
- Currently many industries are still dependent on human inspection due to which there are high chances of human error which affect the quality of product produced.
- Since industry is producing different varieties of product, it become quite difficult to sort them and process them before packaging.

- To solve these type of problem in industry can be minimized by using IOT in developing industry which collect all data as per user demand , can fetched and decode them in accordance of requirement without wastages and generate less human power to control inside industry.
- It is also helpful in **energy consumption** by using energy meter so that it utilize power consumption by the load at a particular interval of time to develop concept of e & ecof@ctory.
- While adding intelligence to our production line can result in **vast cost savings**, the possibilities go beyond mere **optimization**. With better ways of packaging and creating your production facilities, you can also develop whole products to match our customers' needs.
- Apart from inspection, there is also problems related to wiring and control drive in industries which make the maintenance work with difficulty can also be solved using this technology.
- So we are presenting a smart vision based inspection , sorting system and way of packaging as per the user demand to be solve this problem in industry with the concept of e & ecof@ctory.

Packaging system?

- We are proposing fully autonomous integrated packaging systems which include advance level of vision sensor are basically optical sensors based on image processing technology.
- Different P&F sensors will be installed at different steps on the assembly line to monitor and fetch real time data of the process. This data will be received by raspberry pi that will then transmit this data to remote server via Wi-Fi router.
- The assembly line processes will be controlled by plc. The logic for plc can be designed according to the requirement. The connection between plc and raspberry pi will be made using cables. As the output voltages of plc and pi are different, relay will be used between wires for setting up connections.

- Data transferring mechanism also used in PLC to PLC communication where gripper communicate in reference of conveyor and understand process of processing as user requirement.
- Data transferring mechanism is also used in storing data inside a server and provide task in accordance of user requirement.
- After inspection, product will be sorted into different category inside a platform with the help of hybrid pick and place system made up of linear actuator with industrial servo and double acting pneumatic piston along with pneumatic grippers.
- Also conveyor will be drive on induction motor which will be control by VFD (variable frequency drive) from Mitsubishi Electric which will save power and time.

- System will be divided into many station where different process will be carried out.

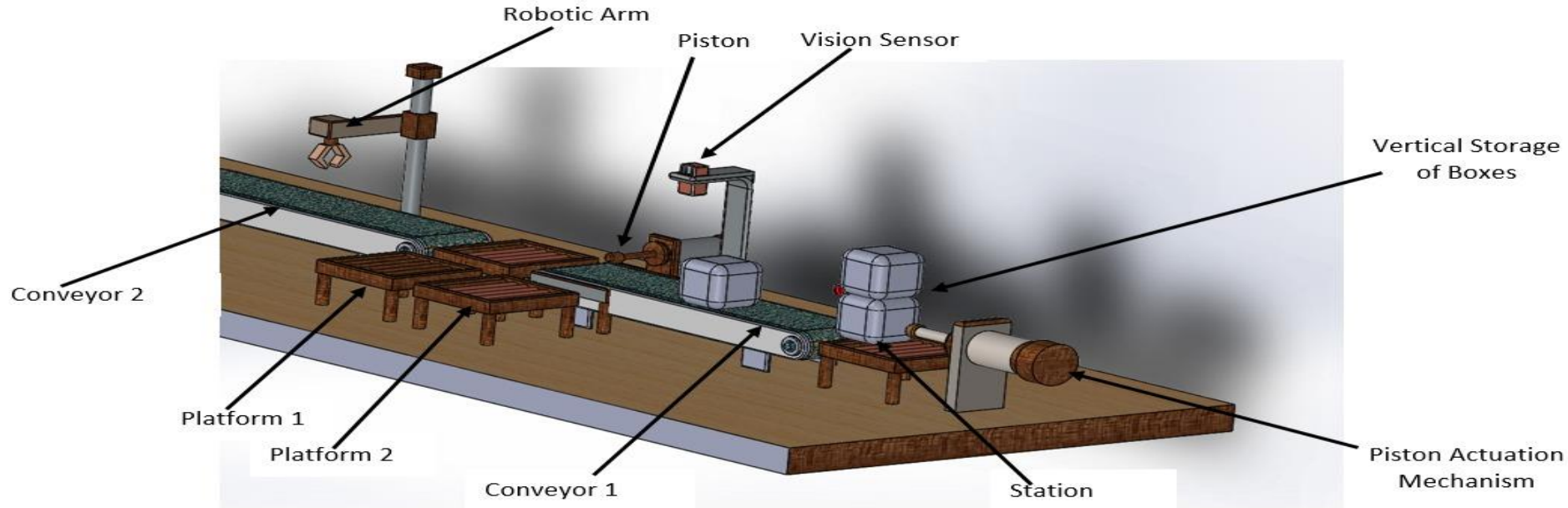


Fig: 1.

Explanation of project

- There is passing of different types of boxes (with different logo) which are placed in a station and come in contact with conveyor.
- During the process of bringing boxes into conveyor can be checked using proximity sensor. There is lots of different boxes are placed inside station (which type of boxes user want) can be detect by using proximity sensor .This sensor basically works to sense boxes and gives command to piston so consequently boxes come in contact with conveyor as shown in fig 1.
- When conveyor move with boxes in forward direction and come in contact with vision sensor , logo detection process start by using image processing and then process of sorting will occur .
- Selected boxes which are placed in platform 1 are collected in a bigger amount. There is task of packaging box by using robotic arm (as a gripper) which works with the help of pick and place method in which it will stock up boxes from platform 1 to conveyor and then collection of box in to platform 3. The arrangement of boxes as per user demand (user want) in a platform 3 and will start packaging boxes in form of bundle in accordance of user requirement as shown in fig.2.

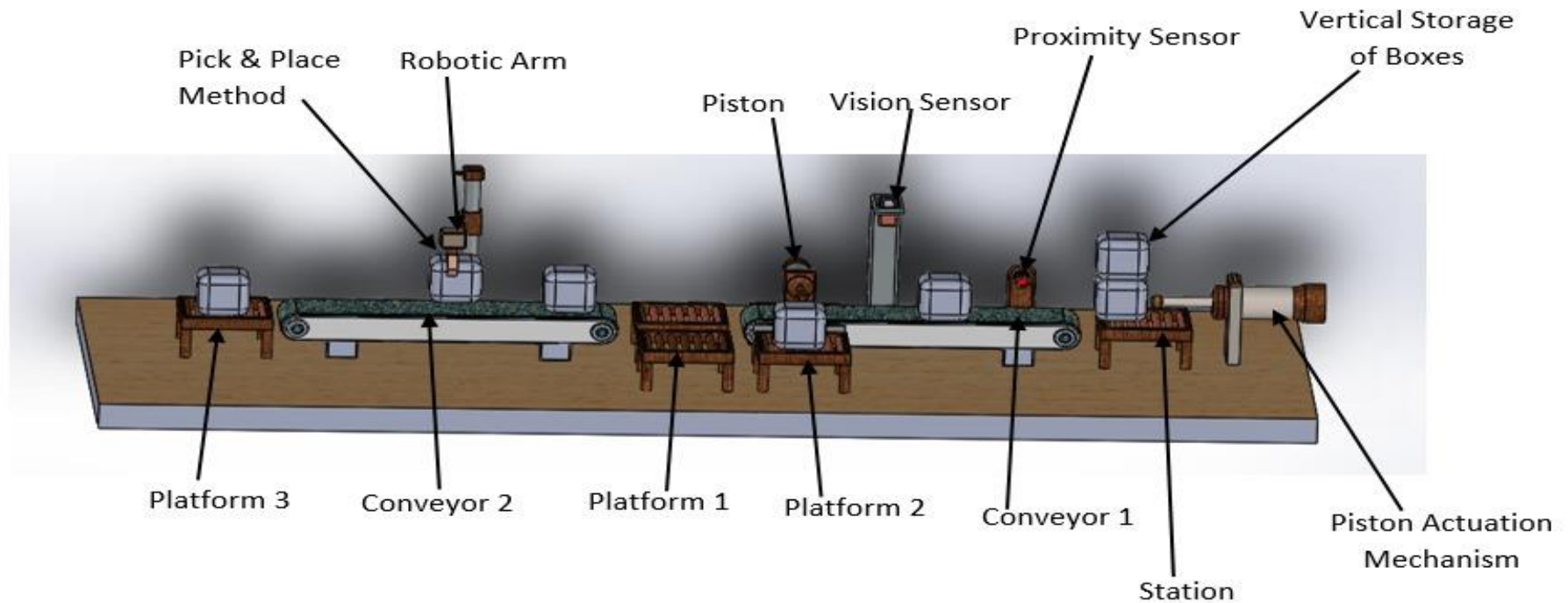


Fig: 2.

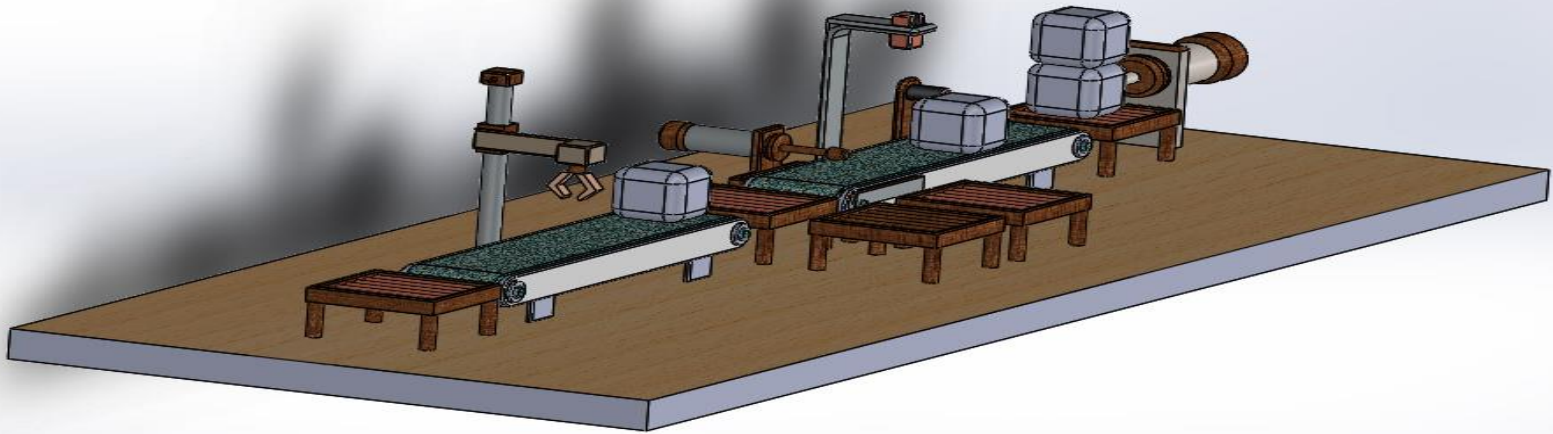


Fig: 3.

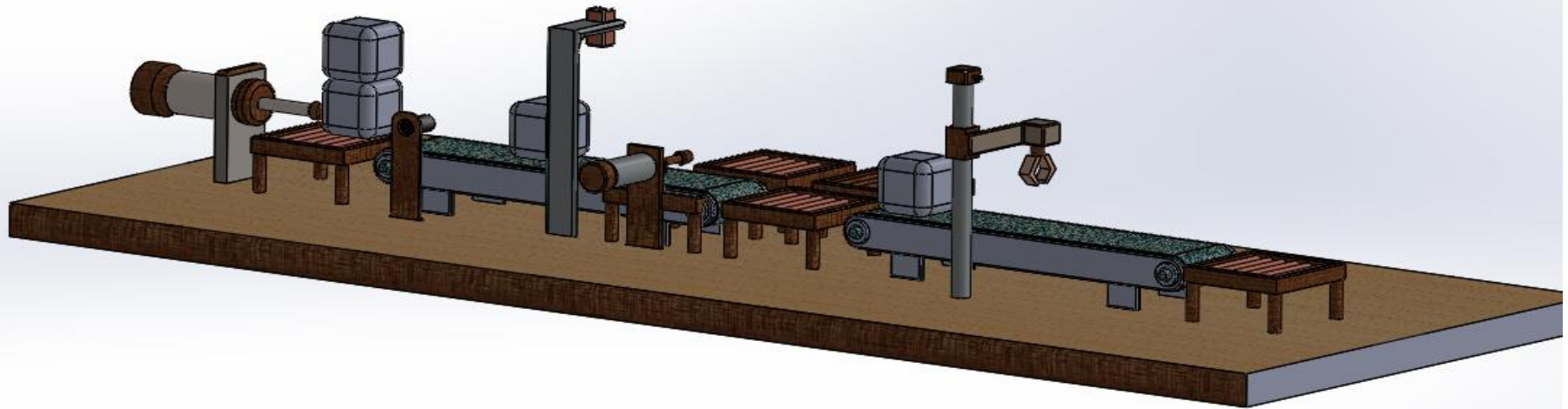


Fig: 4.

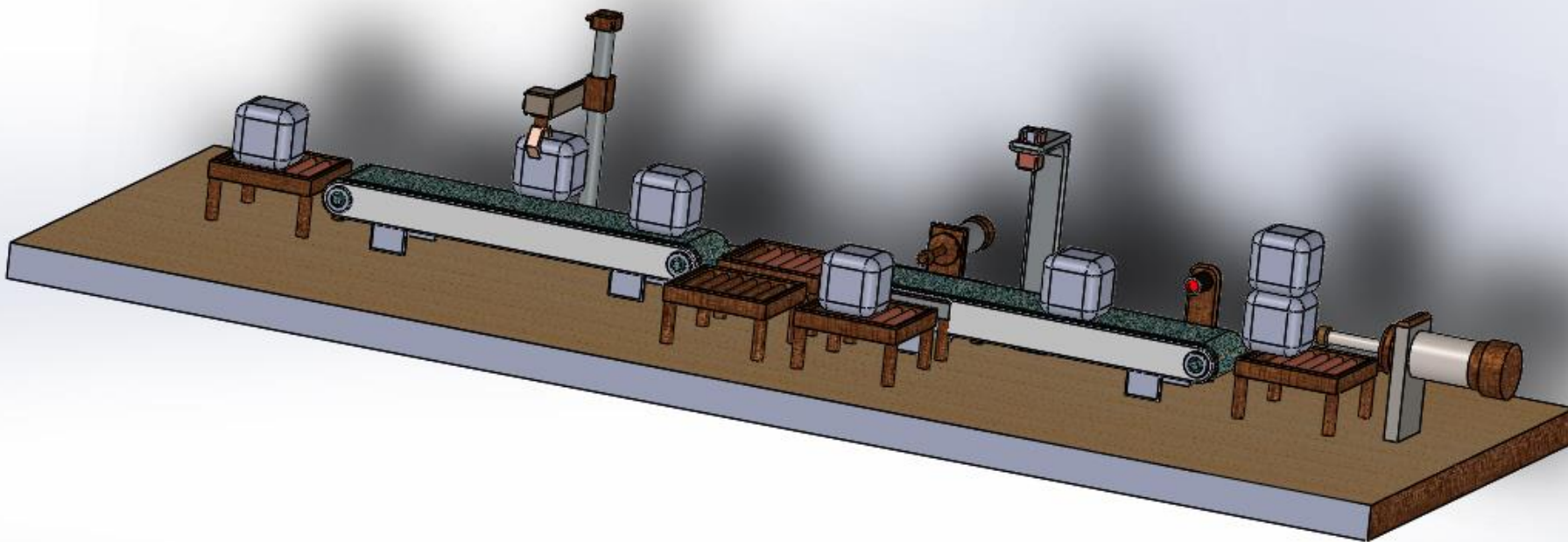
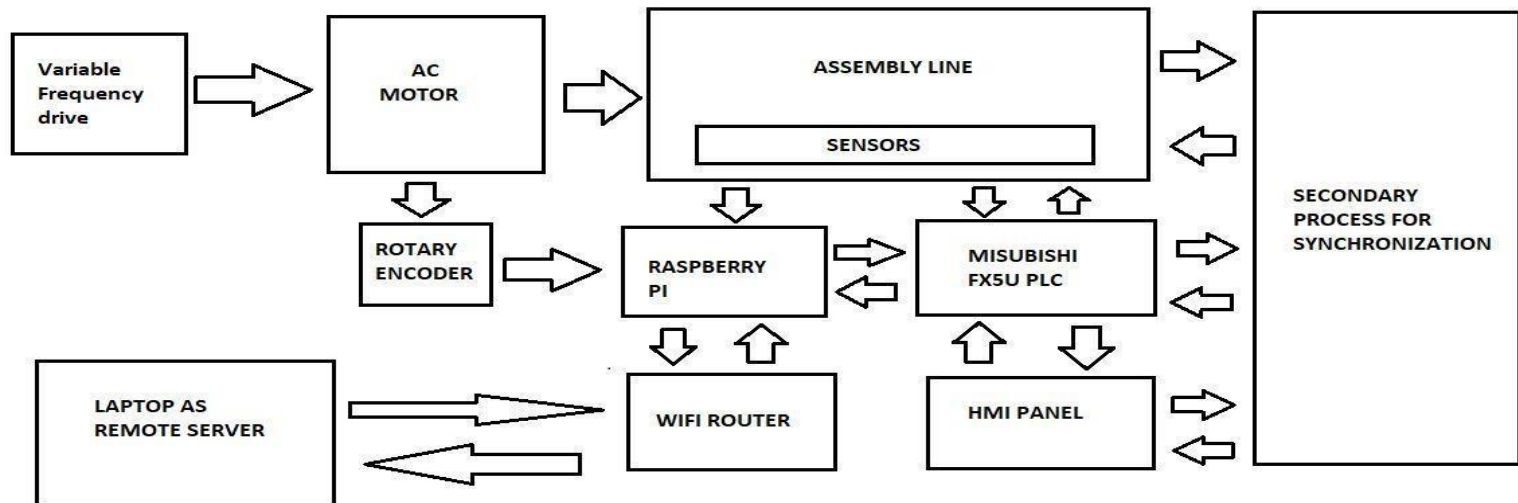


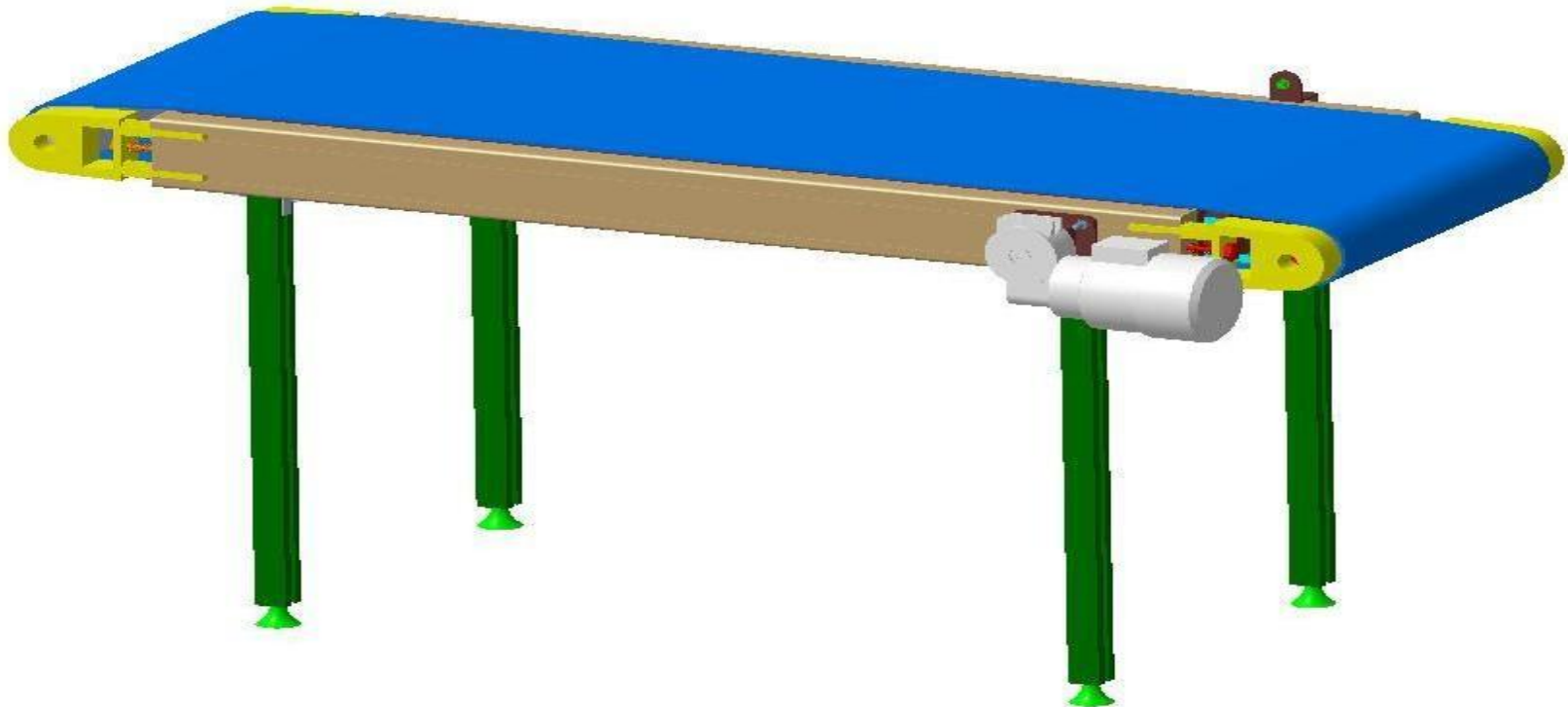
Fig: 5.

BUILD IDEA TO DEVELOP IOT BY USING THIS PROCESS-



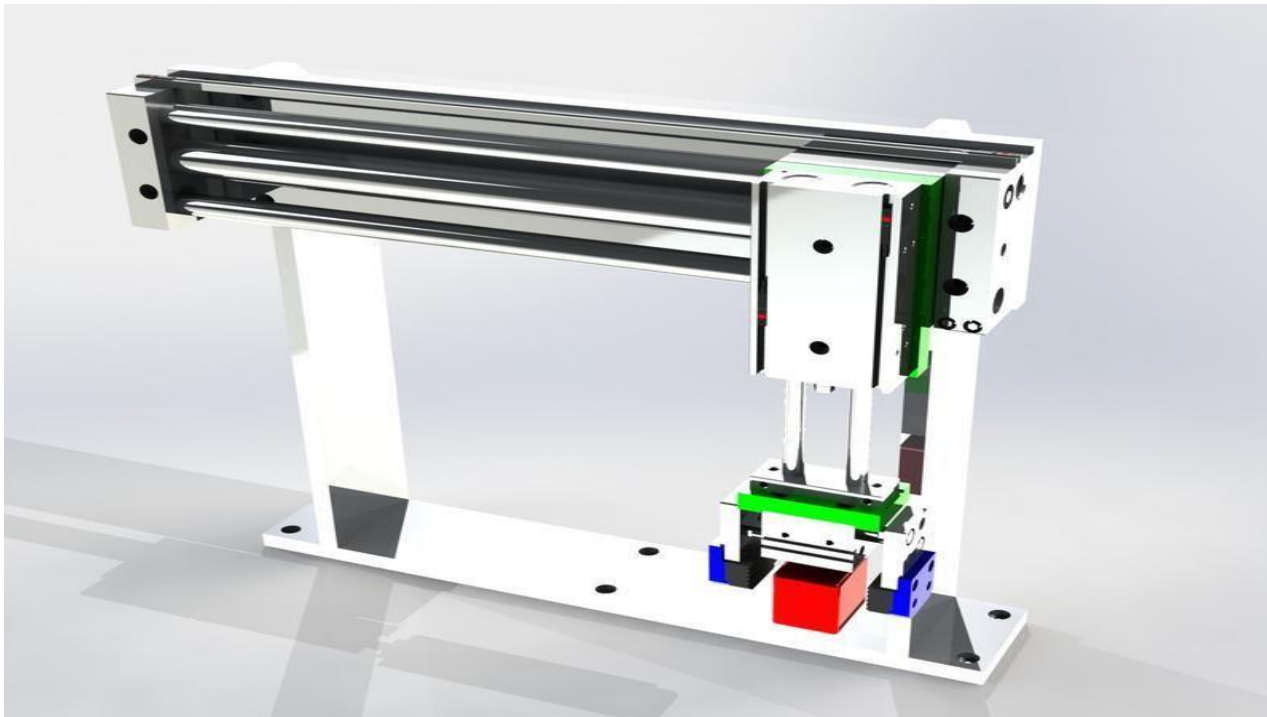
Conveyor Mechanism

- Conveyor will be designed as per industrial sensor and will have 3 phase induction motor as its control drive which will be controlled by Mitsubishi's VFD system.
- Also it will have required coupling and belt for smooth operation.



Sorting and pick-place station

- With help of single axis robot being driven by Mitsubishi's servo motor pick and place task of sorted object will take place.
- With enhanced servo control and accuracy of ball screw mechanism, along with double acting pneumatic piston with coupled gripper, object can be placed into 3 or more different boxes.

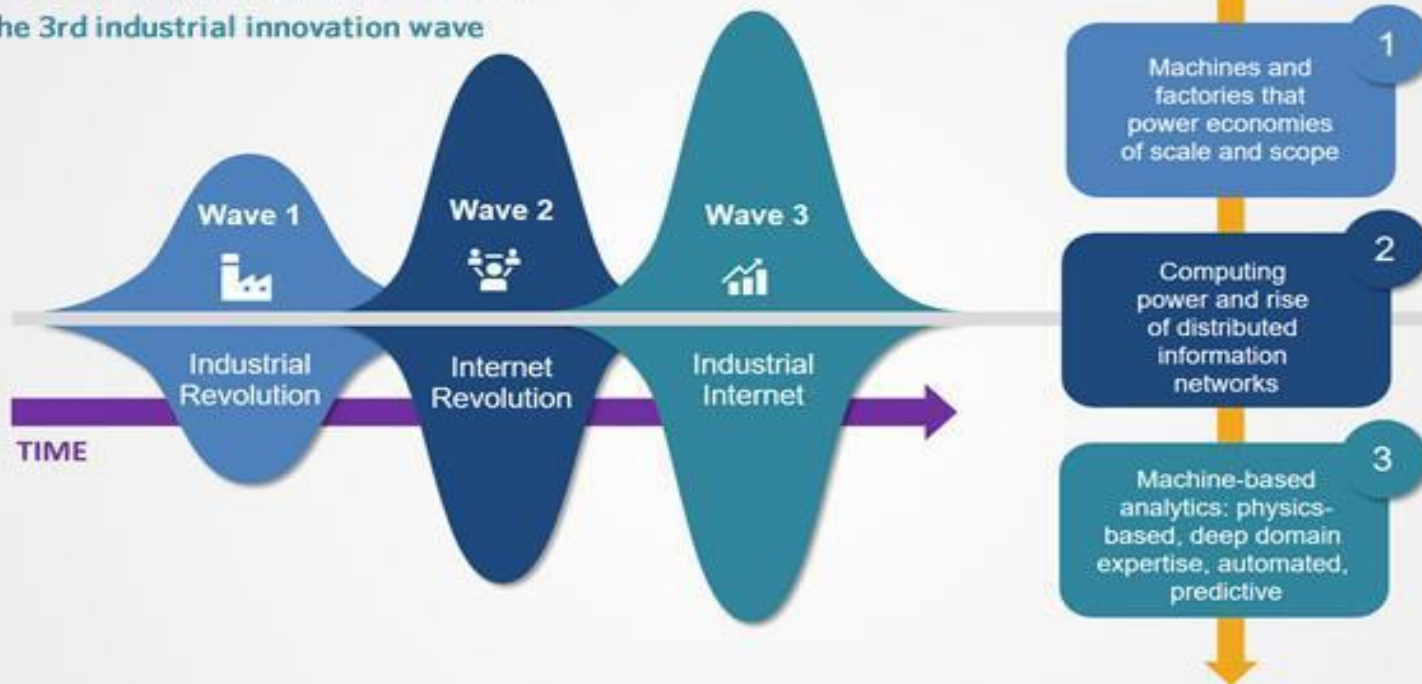


The implementation of internet of things will help us to monitor storage of boxes in container (bigger box). Also as per our requirement we can alter locations of these containers through IOT .Basically our task is to develop IIOT in industries in which it works in accordance of user demand in such a manner-

1. To control production rate by controlling speed of monitor using IOT.
2. Arrange different boxes with different logo using vision sensor (data given by IOT) to make sorting method.
3. Number of boxes requires making a bundle (collection of boxes) by giving command using IOT as per demand of user.
4. Number of bundles (collection of boxes) require in container by giving command using IOT as per demand of user.

The Industrial Internet

- the 3rd industrial innovation wave

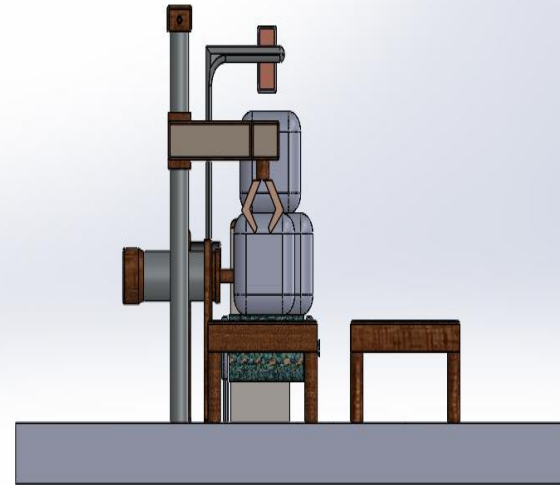
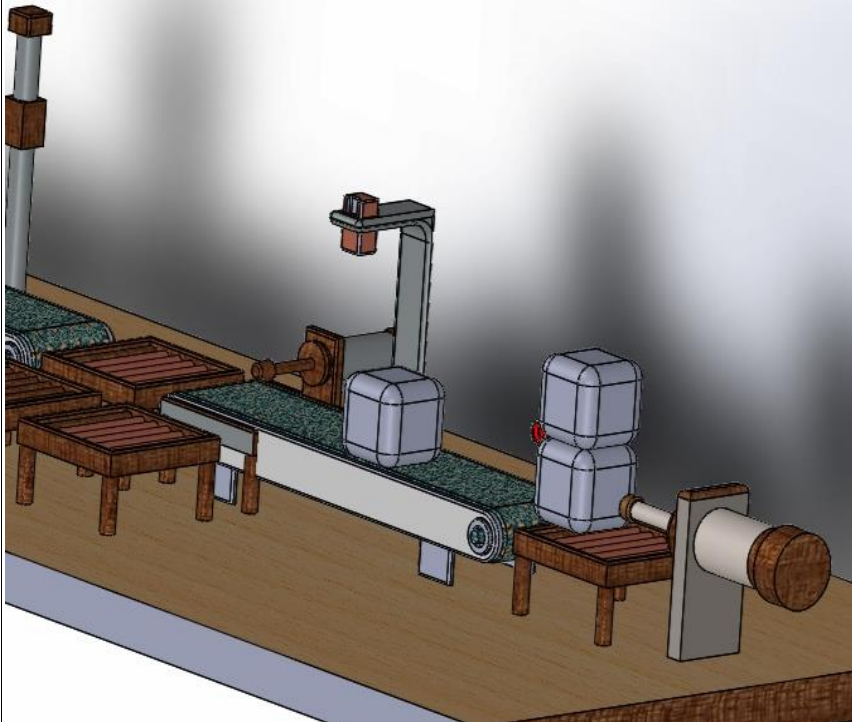


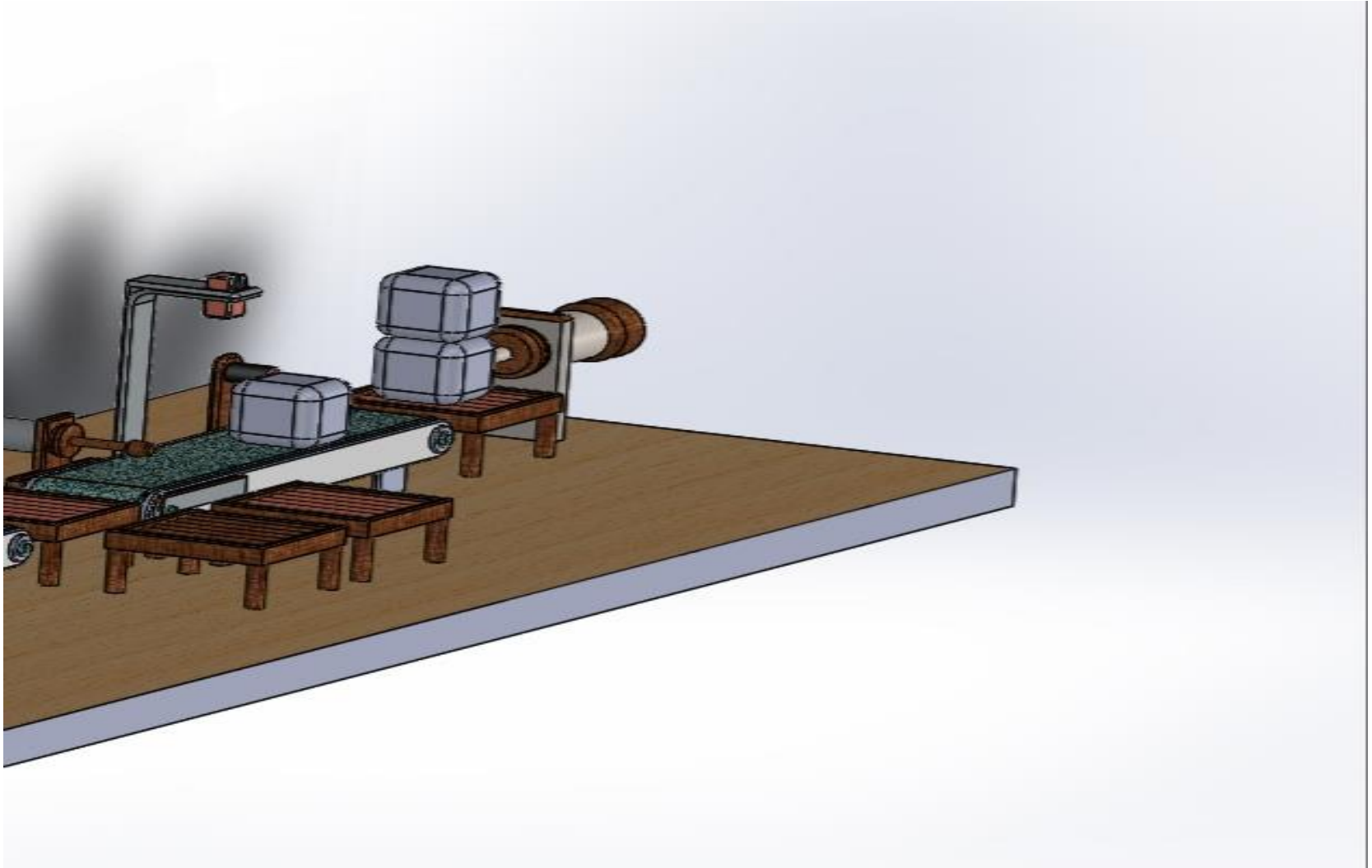
slideshare.net/GE_MC_India/industrial-internet-pushing-the-boundaries-of-minds-and-machines

Based upon: Industrial Internet - Pushing the Boundaries of Minds and Machines



Approximate System





- Since e-f@ctory concept promises enhanced productivity, equipment and Information etc. and ensures quality with traceability.
- In accordance of given proposal we have to generate a new vision of reducing labour cost as well as increase productivity inside the industry which follow e-f@ctory concept.
- System will be designed with help of Industrial networking and INDUSTRY4.0.
- Device information and setting of vision sensor and data of no. of boxes to be collect in packaging can be done online through a web server application which is a part of industrial IOT.
- Also real time status of no. of box processed, box rejected, box sorted, box belonging to specified sorted category etc. will be displayed on G.O.T.
- System supervision and maintenance will be enhanced with the help of Industrial IOT.

- eco-F@ctory allows “visible management” of power usage through the introduction of measuring equipment and technologies that support energy conservation efforts by meticulously measuring power usage. It also promotes the effective installation of inverters and other energy saving devices to not only eliminate wastefulness and surges in energy consumption but to reduce overall power usage by using concept of energy meter.
- As per eco f@ctory concept, we have tried to minimize energy losses by using VFD inverter for inductor motor based convey or drive.
- Also sorting method will reduce cost of labour to identify boxes as per the user demand.
- Pneumatic mechanism will make pick and place mechanism fast and reduce risk of fire. It can operate in volatile atmosphere.

Innovative solution for smart packaging

- As per this year's theme, our project is proposing innovative solution of smart packaging by developing IIOT.
- It will justify e and eco f@ctory concept.
- Will have advance vision sensor for image-processing.
- It will completely based upon the concept of INDUSTRY 4.0 and Industrial IOT.
- Will support an upper level of enhanced Industrial networking with Communication of PLC with so many devices.
- Project will have industrial standard structure and design.
- Have incorporation of all major Mitsubishi Electric FA products like PLC, HMI, VFD, servos etc.

- As per theme and our team name- Team Innovators our focus will be on enhancing already available automation practice of packaging and sorting with the help of INDUSTRY 4.0 and Industrial IOT.
- The system will be accessible via internet i.e. the user can control and monitor the process from another location. This helps in improving the efficiency of the process.
- Wiring of system will be reduce and it will become more smart with vision Sensor's enhanced image processing technology.
- Complete counting and record of products analyzed will be available for supervision by system engineer.
- Incorporation of so many electric drives (both servo and VFD) for smart drive and control application.
- Will reduce industry's problem of complex sorting and wiring can remove inside it.

B.O.M.including FA

components

			AJAY KUMAR GARG ENGINEERING COLLEGE, GHAZIABAD	
			TEAM INNOVATORS	
			IIOT BASED INTEGRATED PACKAGING SYSTEM	
			1 ANSHUL VARSHNEY	
			2 DEEPANSHU TYAGI	
			3 SHIVENDRA SHUKLA	
			4 SHRAMESHWAR CHAUDHARY	
			FACULTY COORDINATOR: MR. RAHUL DIXIT	
		BILL OF MATERIAL INCLUDING MITSUBISHI FA COMPONENTS		
S. No.	Model	FA hardware	Description	Quantity
1	FX5U-32MT/ES	PLC	FX5U PLC with 16 inputs, 16 outputs, built in Ethernet, Analog I/O, RS485 Modbus, 2 AI, 1 AO, 4 high speed output and High speed Inputs.	2 (1 PLC available in college)
2	GS-2107-WT8D	HMI	7" GS TYPE HMI, Touch Screen, Ethernet, RS323, etc.	1
3	FR-D720S-025-EC	VFD	Inverter, 1Ø 230 VAC input, 3Ø 200 VAC output, 400 W (0.5 HP), 2.5 Amps, Built-in Modbus (Induction Motor is not included)	1
4	MCBs	LVS	Set of Two MCBs : 6 Amp and 16 Amp	1 set
5	MR-JE-20A	Servo System	Pulse input type servo, 200w with servo motor HG-KN-23J and necessary cables	1

components

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	3	SHIVENDRA SHUKLA				
	4	SHRAMESHWAR CHAUDHARY				
		FACULTY COORDINATOR: MR. RAHUL DIXIT				
		Bills Of Materials Excluding Mitsubishi Electric FA Component Set				
S.No.	Items	Brand name/ vendors	Model/Specification	Total Quantity	Cost/Unit	Total Amount
1	Vision sensor	Pepperl+fuchs	VOS310-100/Vision for complex object recognition	1	-	Available in college
2	Pneumatic Gripper	Robokits india	Festo gripper , high quality advanced robotic gripper for robotic Arm and other gripping applications	1		Available in college
3	Proximity sensor	Pepperl+fuchs	Infra-red based 5m range	2		Available in college
4	Induction Motor	Brook Crompton Greaves Ltd.	3 phase TEFC induction motor, 0.37 KW class-F	1		Available in college
5	Single acting piston	Janatics	10cm stroke	1		Available in college
6	Double acting cylinder	Janatics	8cm stroke	2		Available in college
7	Rodless Cylinder	Janatics		1		Available in college
8	DCV	Janatics	5/2 and 3/2 Solenoid actuated	4		Available in college
9	Metal Rods	Local	1200mm , dia:35mm	1	600	600
10	Aluminium profile	AV engineers	30*30mm	25	350	8750
11	L bracket with T nuts	AV engineers	For 40mm profile	80	42	3360
12	Profile rubber, cap	AV engineers	For 40mm profile	15m	20	300
13	Magnetic Reed Switch		Air Cylinder 1.5 wired CS 1 U Magnetic reed Switch Sensor DC-AC (5-240V)	2		Available in college
14	Electrical wires(blue, white, red, black)	Gupta Electricals (local)	1mm	30m	30	900
15	Wire casing	Gupta Electricals (local)	with cover	20m	50	1000

16	Emergency Switch button	Gupta Electricals (local)	PNP type	2	50	100
17	Aluminium bar and coupling		10mm dia	5kg	200	1000
18	Conveyer belt	Local market		2	350	700
19	Nuts, bolt warsher	Mittal Hardware	Miscellaneous			500
20	Ethernet cable	amazon.in	Crossover type, 10T/100T	8	50	400
21	Router	amazon.in	TP-Link TL-SF1008D			600
22	Conveyer Roller			50m		350
23	Tie Knots	Mittal Hardware	5mm			50
24	Electrical Tape	arora Electronics		4	20	80
25	stationary		papers, double sided tape, posters, markers, flex etc.			500
26	Aluminium Sheet with T slots	AV engineers	with t slots for mounting	1.4*1.4m		Available in college
27	Raspberry pi	Amazon.in	Raspberry pi 3 b+	1		3195
28	Relay Block		Shavison Relay Module AS 355 -24V N-S-OE, 1C/O, 8 channel 24V DC Coil, OEN relay, reverse blocking diode.	1		Available in college
29	SMPS	Amazon.in	12V, 10Amp SMPS – 120 W DC metal	1	500	500
30	RS-485	Amazon.in	DTECH4 Feet USB to RS422 RS485 Serial port converter adapter Cable with FTDI chip support	2	160	320
31	Air Compressor		It provide air to the pneumatics devices.	1		Available in college
32	Pneumatic Connector and pipes		Help to carry air			Available in college
					Total	23205

THANK
YOU