Idea Proposal

Simple Approach to Improving Industry Work-Flow Efficiency

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1 Objective:

The main objective of this idea is to develop a system that would enable the our garments industry to increase their production efficiency with minimal invasion.

2 Goal:

The whole manufacturing industry is progressing towards PLC.As such machines are becoming more computerized. Each sub-parts of the whole production process co-ordinate together to produces a fluid flow of production.But this fluid flow gets disrupted due to machine failure, worker error which throttles the total throughput and efficiency. Moreover wastage is created due to over-flow of production, this overflow occurs due to lose coupling of the demand and the supply chain.To counter this issues we wish to develop a system that would monitor the production process through an Artificial Intelligence which will try to maintain steady throughput by reducing electric cost,maintaining proper room temperature, predicting and detecting machine failure and showing live production rate in order to increase the efficiency.

3 Challenges:

The garments factory produce most of their commodity through a strict regiment of steps that should be maintained constantly to deliver its products within a certain deadline.But this continuous flow of production is hampered due to **human error**, **loss of durability of machines**.The side effects of this problems are poor quality product,temporary shutdown of production and sudden disruption of production flow.

4 Causes:

Firstly, human error is caused by inexperienced workers, irresponsible workers, work-load, personal issues, satisfactions due to low payment.Among this reasons **work-load** and **inexperience worker** influence human error.

loss of durability of machines are mainly caused due to improper maintenance of machines. Machines are continuously running to produce commodity at an steady rate, as the production flow continuous efficiency of machines deteriorate day by day giving rise to faulty components in mechanical and electrical parts of the machines.

5 Approach:

Firstly, human error can be reduced in production flow by building an A.I that would constantly monitor the parameters defined by the human workers in production through a camera. The A.I would monitor the parameters and also would predict what would be the final output of production based on parameters defined by the workers.This would take pressure off workers who are given heavy work load and safe guard against irresponsible workers in case of their clumsy mistake.

Secondly,loss of durability of machines are well know by experienced workers, and this experience in handling machines enables them to schedule maintenance task for machines used for production, this experience also helps them to stay prepared in case of any disastrous failure of machines,like the workers its also possible to detect faults

and problems in machines using A.I and Predict disastrous machines failure.Some article regarding how to detect this faults.

- (1)RISP Vision On Fault Detection
- (2)Medium Article on Fault Detection
- (3)Machine Learning and Deep Learning Algorithms for Bearing Fault Diagnostics

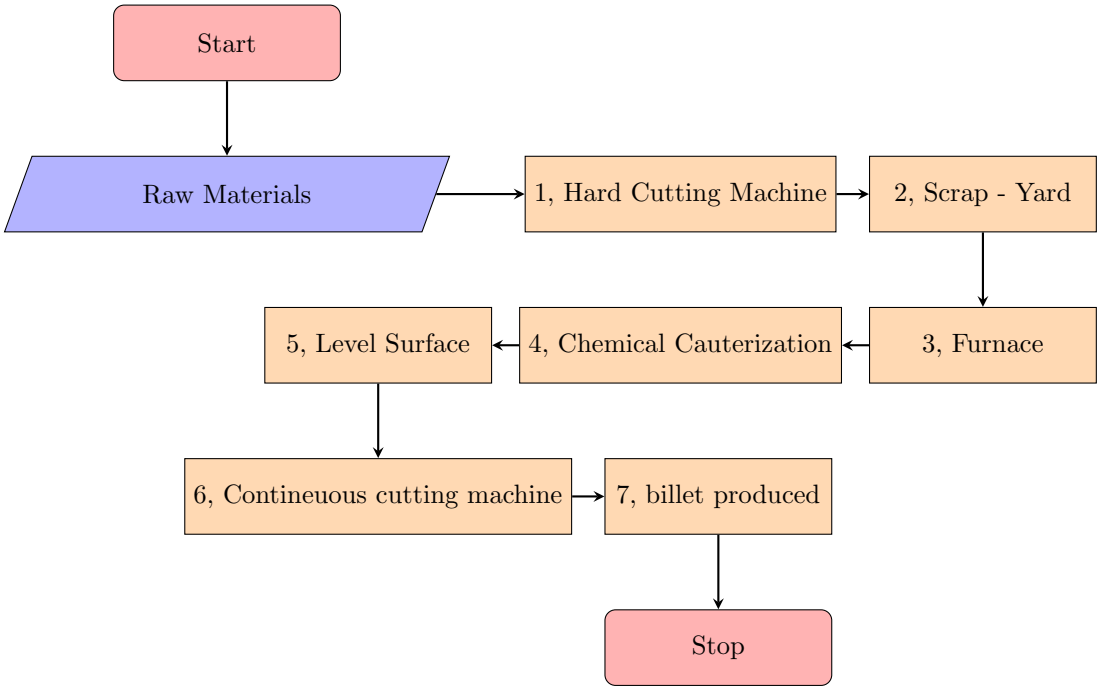
6 Possible Issues:

Possible problems to face are collection of data in the case of detecting faults in machines and how dynamic is the process of production.

7 Work Flow of different Industry :

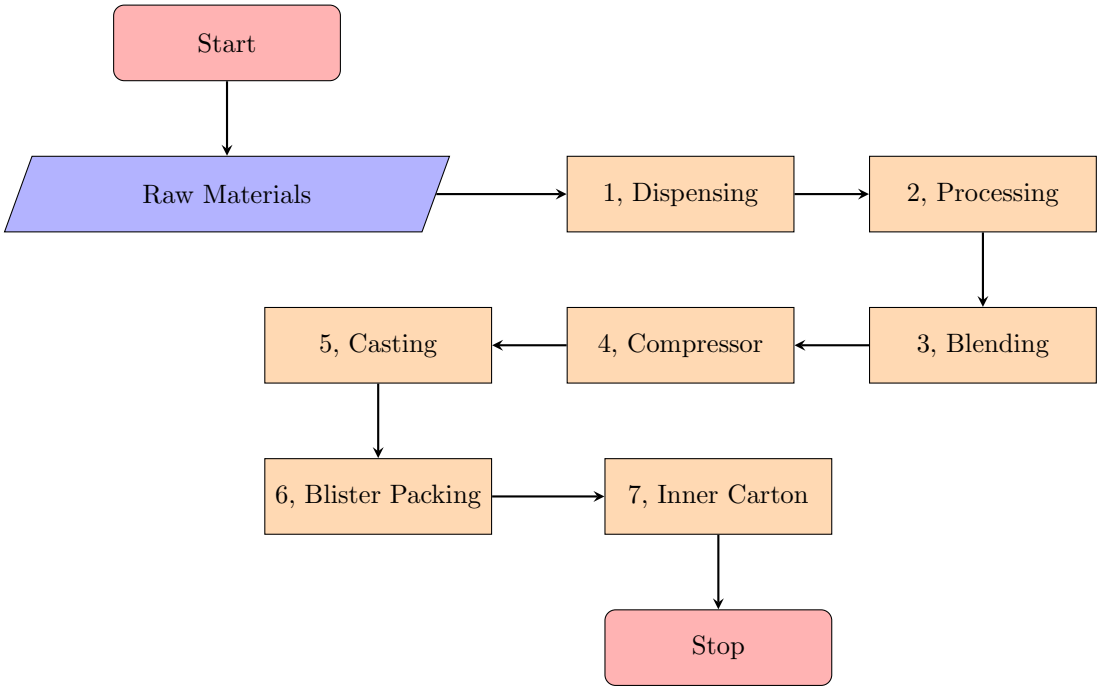
Different types of industry produces different products but the work flow of all the industry follows a simple pattern. All this industries use machines which are operated by human personnel, this machines are prone to human error if not properly monitored. examples of some work environments and its human interaction.

7.1 abul khayer steel



- (1) 1 person control this step for proper cutting of raw materials
- (2) after cutting 2 person takes the materials from scrapyard to the furnace, the material is transferred to the furnace using a crane operated by one person
- (3) 2- 3 monitor and control the furnace
- (4) 2 person apply chemical cauterization on the melted materials of the furnace
- (5) 2 person level the melted materials coming from the furnace
- (6) 2 person cuts the materials into equal chops of billet
- (7) billet is produced
- transition between some of the process are done through crane which are operated by person

7.2 Drug international medicine



- (1) 2 person control this step one weights the raw materials one takes the raw material to the next step
- (2) 2 person maintains this step one drys the materials and the other puts in the blender
- (3) 1 person controls the blending
- (4) 1 person controls the compression
- (5) 3 person is assigned to casting
- (6) 1 person operates the machine 2 person checks the blister packing
- (7) 3 person checks the carton packing

8 Smart Manufacturing:

Smart manufacturing is a present trend in market that is continuously growing with time.Major forces driving smart manufacturing in manufacturing market are the growing need for centralized monitoring and predictive maintenance of manufacturing infrastructure. The increasing need for agile production, operational efficiency, and control, and demand-driven supply chain and connected logistics are also expected to drive the market.At present we are able to collect data using different types of sensor data due to wide spread of cloud technology. Cloud technology allow us to collect data in large volume and this data enable us to us to push toward smart manufacturing to answer questions like "what to do" and "when to do it".The only threat existing in data driven technology is security. Smart manufacturing can be divide into three parts

- Product and control solution: This include automation parts and products
- IT solution enablers: power the whole concept of IoT and asset management. They help in building control, monitoring and analytics infrastructures.
- Connectivity solution: servers,wan,router and wifi for smooth transition of data.

9 Data Driven Intelligence :

Data driven intelligence is the forefront of industry at present.The advancement of machine learning techniques bloomed new possibilities of efficiency maximization never approached before.Machine learning allowed us to develop techniques to analyze data that are non-linear, which plagued the manufacturing industry for a long time but as time progressed it was evident that non linearity was not the only problem of developing smart manufacturing. Machine learning algorithm worked better on a hand picked features, but the massive data in smart manufacturing imposed a series of challenges to overcome like the present of multimodal data, high dimension of feature space and mutlicollinearity among measured data.This complications profoundly hinder the performance of the traditional machine learning algorithms.To properly address this challenges and issues, deep learning emerged as a new solution to handling and analyzing this big data.

Deep learning allowed us to derive meaningful insights and features from complex and massive data. The idea behind deep learning is divide and conquer using mathematical mapping like a filter to co-ordinate a balance between linearity and non-linearity in data. Deep learning allowed us to develop high performance models using data where we do not use the handcrafted features.

The use of such algorithms would allowed us to derive patterns from data and give meaningful insight and decisions.The key areas of manufacturing where it is useful

- Product Company: Product life-cycle logistics and product design data tractability
- Manufacturer: Process control,shorter down time configuration flexibility and tractability.
- Supplier: Remote Diagnostics maintenance and improve availability

10 Data Collection:

Data can be collected in many ways and the ability to collect this huge volume of data allows us to make decision that maximizes factory efficiency. A manufacturing factory works in various small segmented areas to produce their product and for such reason it is possible for us to collect data from all this areas that co-depend to complete the whole manufacturing process.This areas include

- Object or Product: Product number progress and products parts
- Equipment: Sensor data and abnormalities in production.
- Process: Total performance of the whole process and it's quality
- People: Gps location and its location activities
- Environment: The temaperature,humdity and usage volume measurement

Data collected in this manner are non-linear,multi-modal,Non-structured, has high volume and Mulit-formatted.Through various data cleaning techniques we structure it into our desirable form.Some of those techniques are removal of duplication,prediction of missing values,removal of corrupted data,scouting and removal of false data sets.

11 Decisions and Analytics:

So far we know the areas to collect data from and the areas to use those data on but one question remains, what are the things we would answer and how that will benefit the manufacturing process.In every manufacturing factory the key to maintaining a efficient flow of production is making the right decision at the right time, delay in taking initiative or making the right call can incur loss in large proportion.The answers to the questions that we need are mainly to make those calls are

- Descriptive: Capture product condition,environment and operation
- Diagnostic: Examine the causes of reduced product performance and detect failure.
- Predictive: Predict product quality and patterns that signal impending events
- Prescriptive: Identify measure to improve outcome of correct problems

Above points answers question like what happened,why it happened, what will happened and what are the action to take.This questions reveal a big picture about the manufacturing process and give us enough information to make informative decision at the nick of time.This answers were hard to predict in the sense that data collected for answering this question were complex in nature and could not be answered accurately with traditional machine learning algorithms.Deep learning paved the way for us to answer this questions using data which are high in velocity, variety and volume.