

Improving on time delivery of tractors to customers by optimizing the flows in Supply chain “MAKE TO ACTUAL SALES” (DOMESTIC MARKET)

About TAFE:





US \$1.5Bn

TURNOVER



3rd

LARGEST TRACTOR MANUFACTURER GLOBALLY BY VOLUMES

FARM MACHINERY



TAFE TRACTORS



MASSEY FERGUSON



EICHER TRACTORS



IMT



AGRISTAR

GEARS & TRANSMISSIONS



HYDRAULIC PUMPS & CYLINDERS



TMT ENGINES



ENGINES

TAFE POWER



GENSETS

BATTERIES



AMCO

ENGINEERING PLASTICS



VEHICLE FRANCHISE



TATA MOTORS

TAFE ACCESS LIMITED OFFICIAL

PLANTATIONS



TAFE – Tractors and Farm Equipment Limited, is an Indian tractor major incorporated in 1960 at Chennai, with an annual turnover of INR 93 billion (2014-15). The third-largest tractor manufacturer in the world and the second largest in India by volumes, TAFE wields about 25% market share of the Indian tractor industry with a sale of over 150,000 tractors (domestic and international) annually.

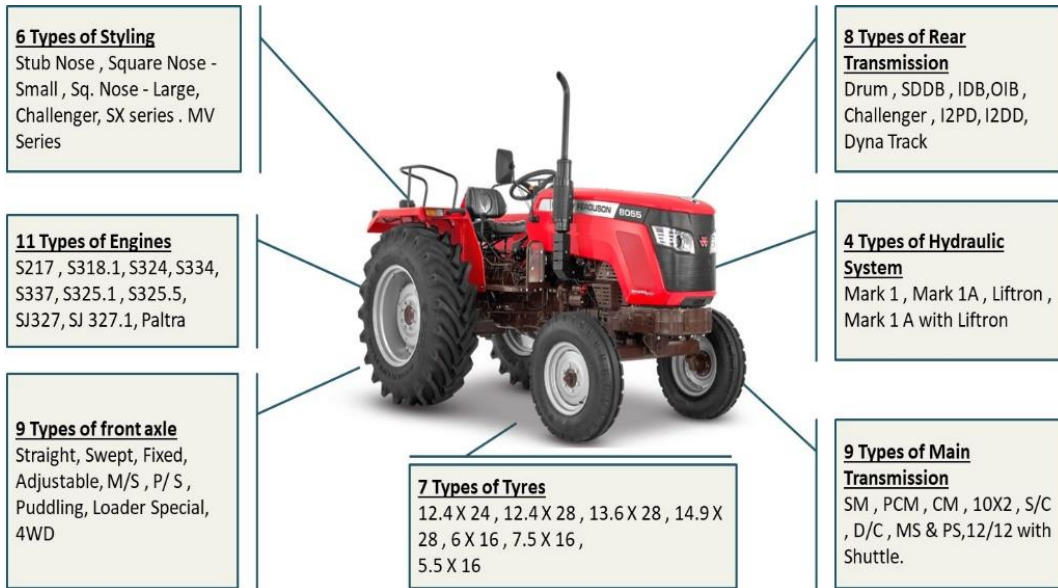
Need for the Project:

TAFE has been working on many continuous improvement projects over the years to make available, the right model of tractor at the right dealer point at the right time to the **Domestic market customers which is 80% of the TAFE Volume**. But always there had been instances of mismatch of the Customer need and tractor models available at the Dealership. In view of the highly competitive market scenario, customers were not willing to wait for the right model be made available to him in some days, due to this there had been opportunity loss of a sale. So it became necessary to look at opportunities for improving the full cycle of Sale to Production process and consequently making the tractor available at the dealer ship end.

Scale of implementation impact:

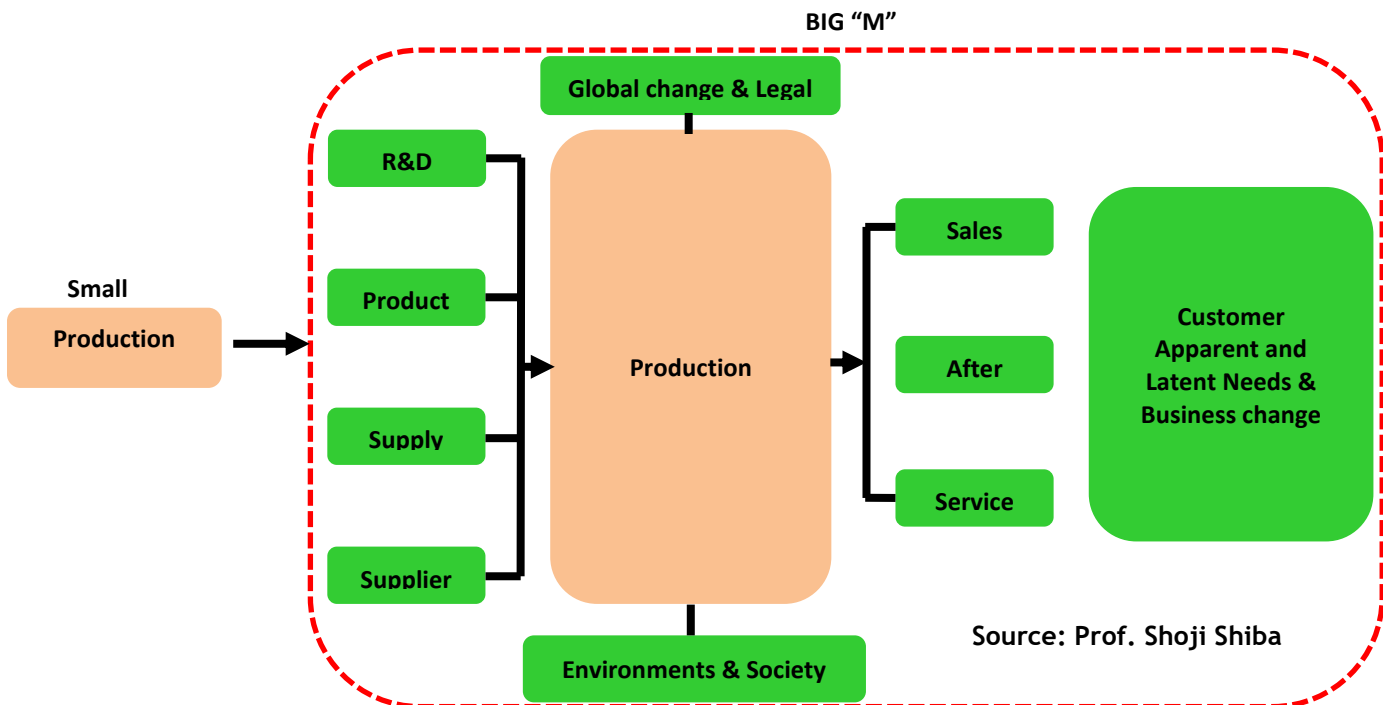
300 + Dealer ships, 400 + Models /Variants, 400 + suppliers & 19000 + part numbers.
Capacity 450 tractors per day (Two plants), Every 4.4 minutes one tractor to roll out of assembly line.

Models and Variants (Representational):

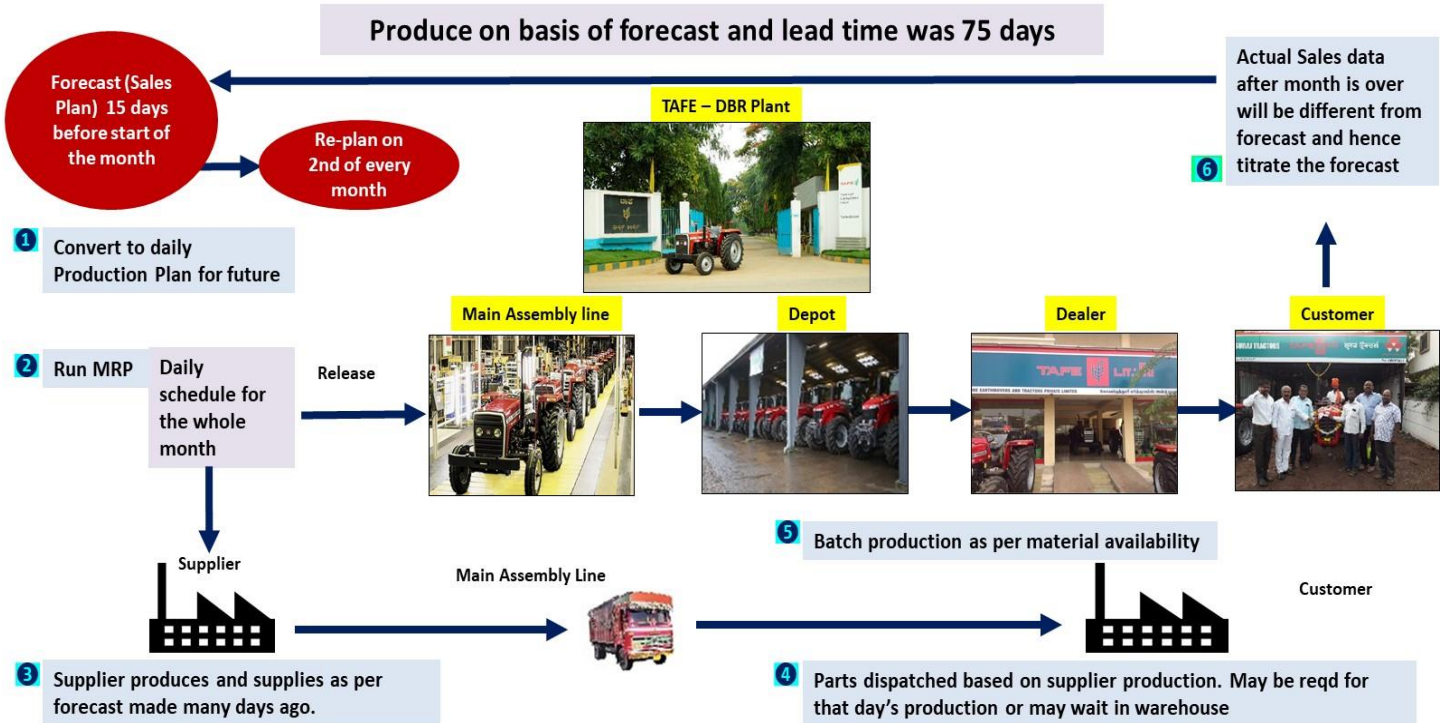


Mindset change:

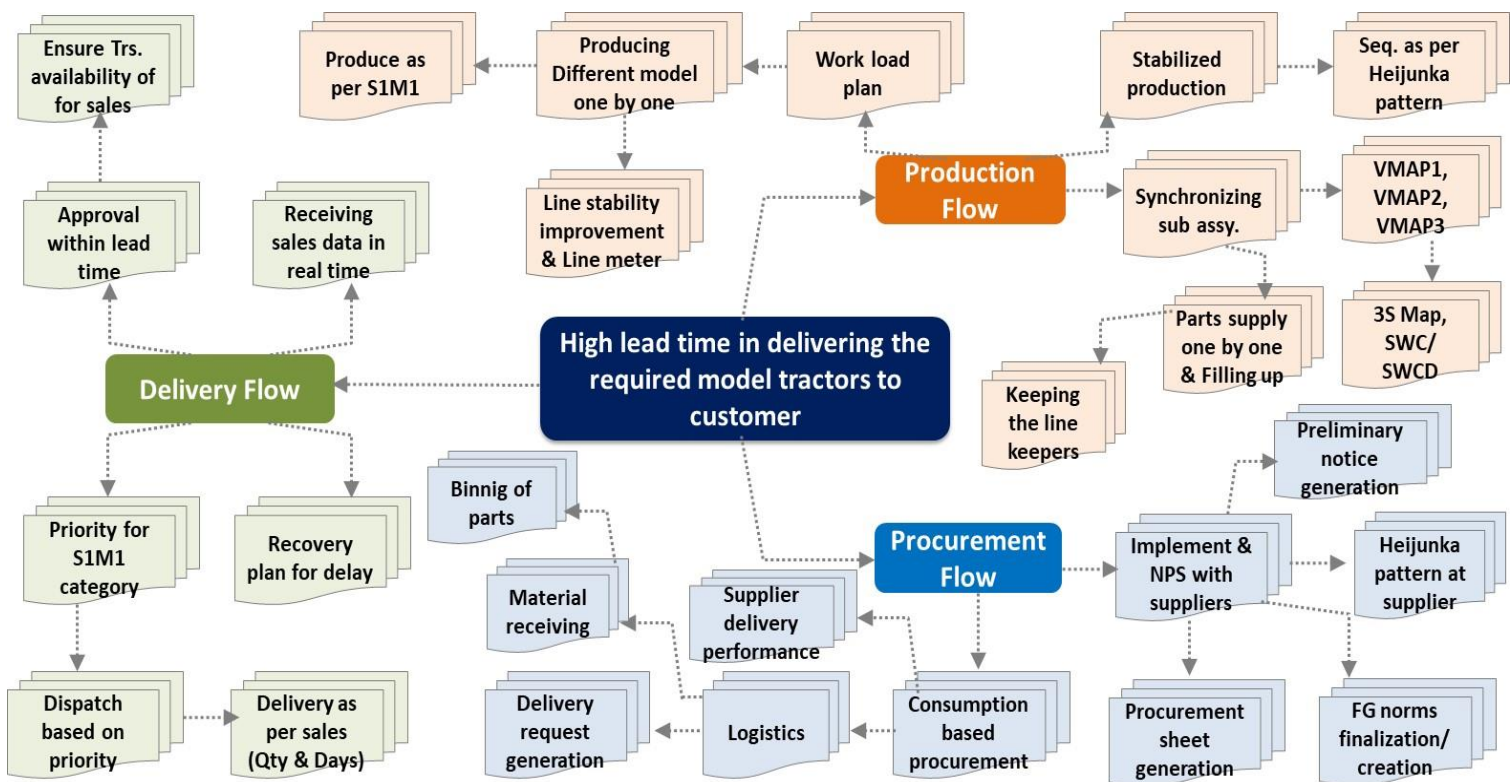
Thinking Change – Small “m”(Production) to BIG “M” (Over all Business)



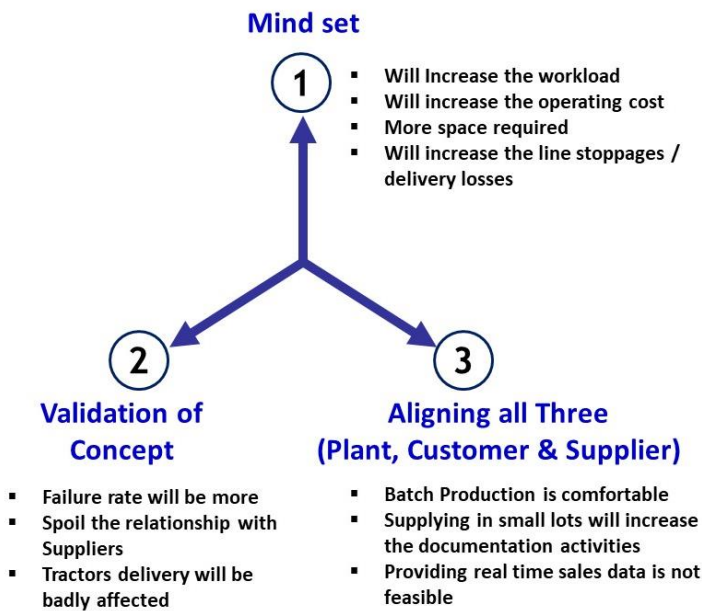
Traditional System followed by all Manufacturers (Before):



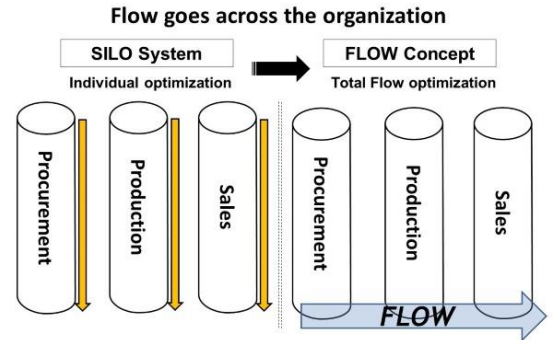
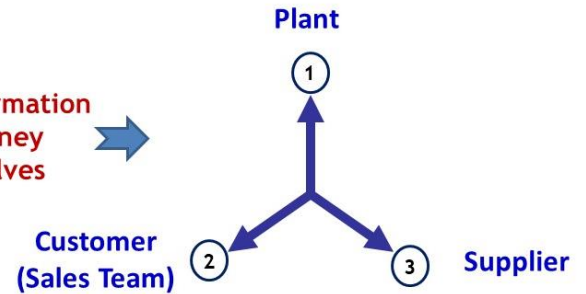
Brainstorming – Relationship diagram:



Challenges faced:



Transformation journey Involves

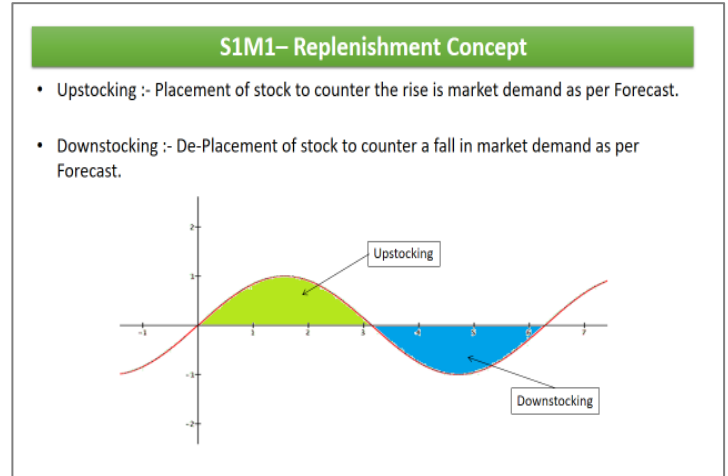
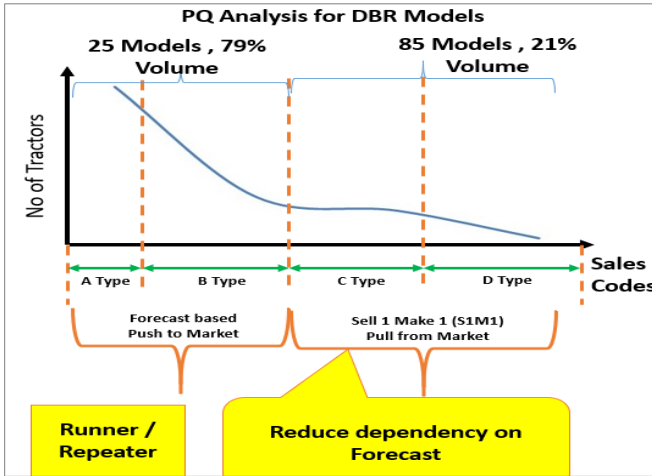


Methodologies & Significant Changes:

Area	Traditional Way	SYNCHRON Way	Concept / Tools Used
Customer (Sales)	Receiving sales data at end of month.	Receiving sales data in real time.	Dealer Management System (Intranet portal)
Plant	Production plan based on forecast	Sales based production	Producing different model tractor one by one
	Skewed production in current process.	Stabilized Production	Heijunka
	Process flow, machine cycle time	Observe only material flow.	3 S Map
	Productivity improvement through bottle neck study.	Productivity improvement through SWC & Line balancing	SWC / SWCD
	Integrated Main & sub-assembly line	Create Tier - Separate Sub-Assemblies from Main Line.	VMAP2
	Parts supply by batch process	Parts supply one by one & filling up method	Line Keeper
Supplier	MRP based scheduling	Consumption based scheduling	NPS
	Monthly plan-based production	Uniform delivery request based on consumption and hence smoothed production	Heijunka

Delivery Flow

S1M1 (Sell One Make One) - PQ Analysis & Replenishment concept:



Benefits of Heijunka:

1. Uniform delivery of different models of tractor throughout the month.
2. Balanced assembly Takt time for the finalized Heijunka pattern.
3. Uniform pull of different part numbers.

Old Daily Production Method:

Assembling of tractors in a single assembly line were grouped into three types Small (S), Medium (M), Large (L) based on tractor power and assembly Takt time. Assembly of tractors were on batch mode like S,S,S,S,S,M,M,M,L,L,L,S,S,S as shown in below table.

Work content



Assembly sequence	1	2	3	4	5	6	7	8	9	10	11
Group	S	S	S	S	S	M	M	M	L	L	L

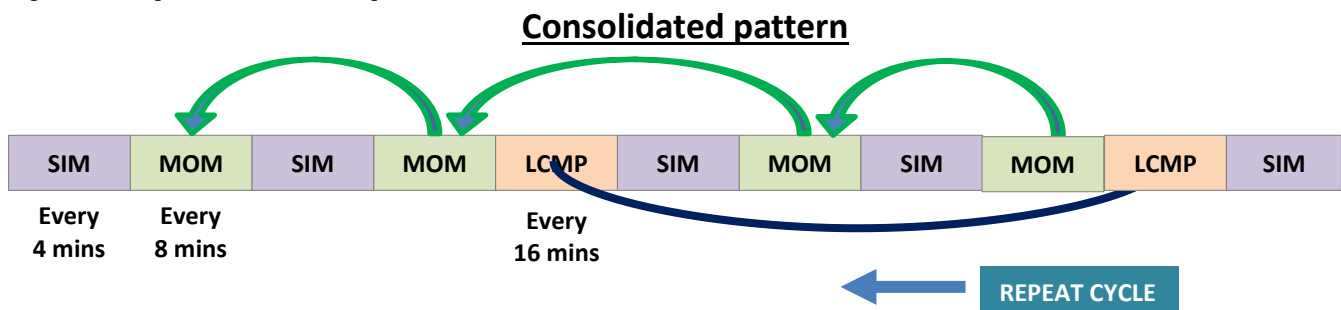
Tractors were mounted in batch mode. Actual takt time is fluctuating with assigned takt time. It was having imbalance in the assembly line.

It created many chaos to the assembly line in terms of delay in delivery of tractor, assembly time, parts supplies. To overcome all those issues, HEIJUNKA methodology was implemented to optimize the variations and produce in a balanced way.

Group classification:

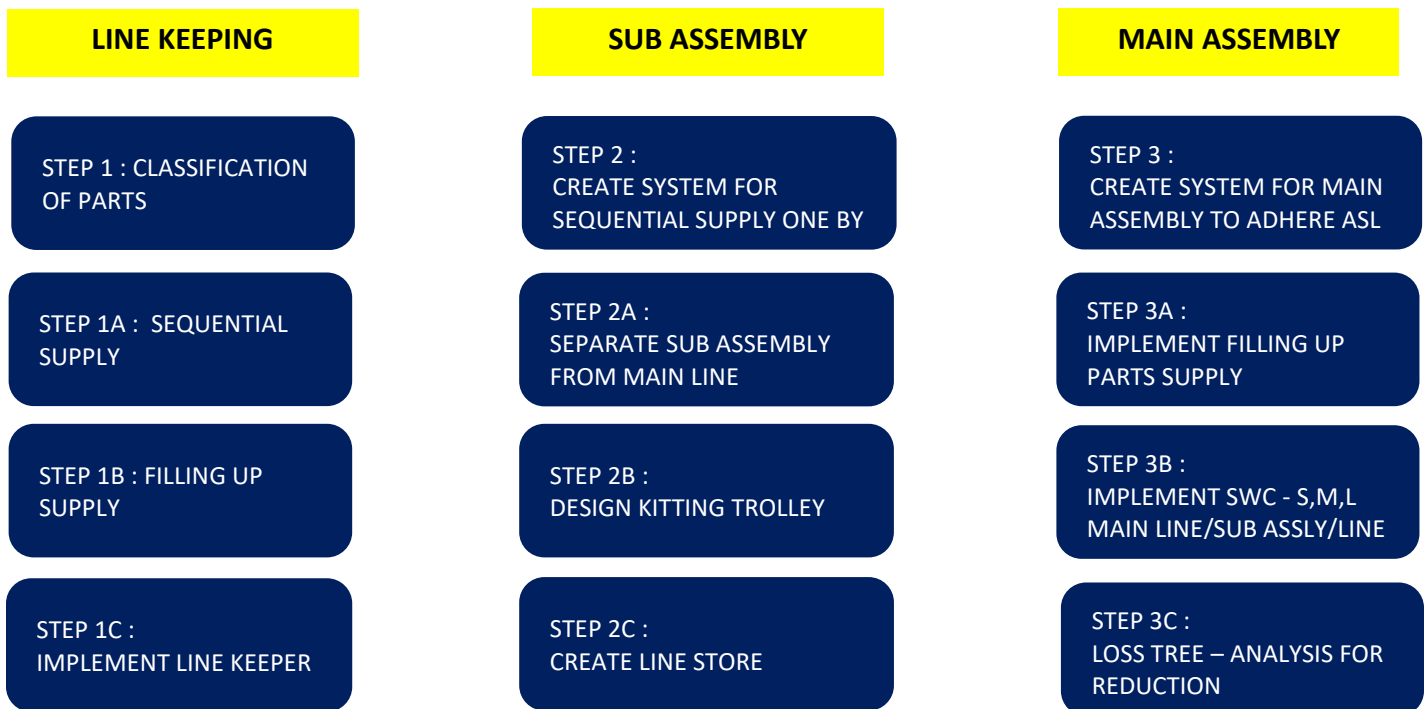
- a. Grouped by various features of tractors
- b. Currently three features are considered - HP, Brake and Steering.

Heijunka pattern – Spread over method:

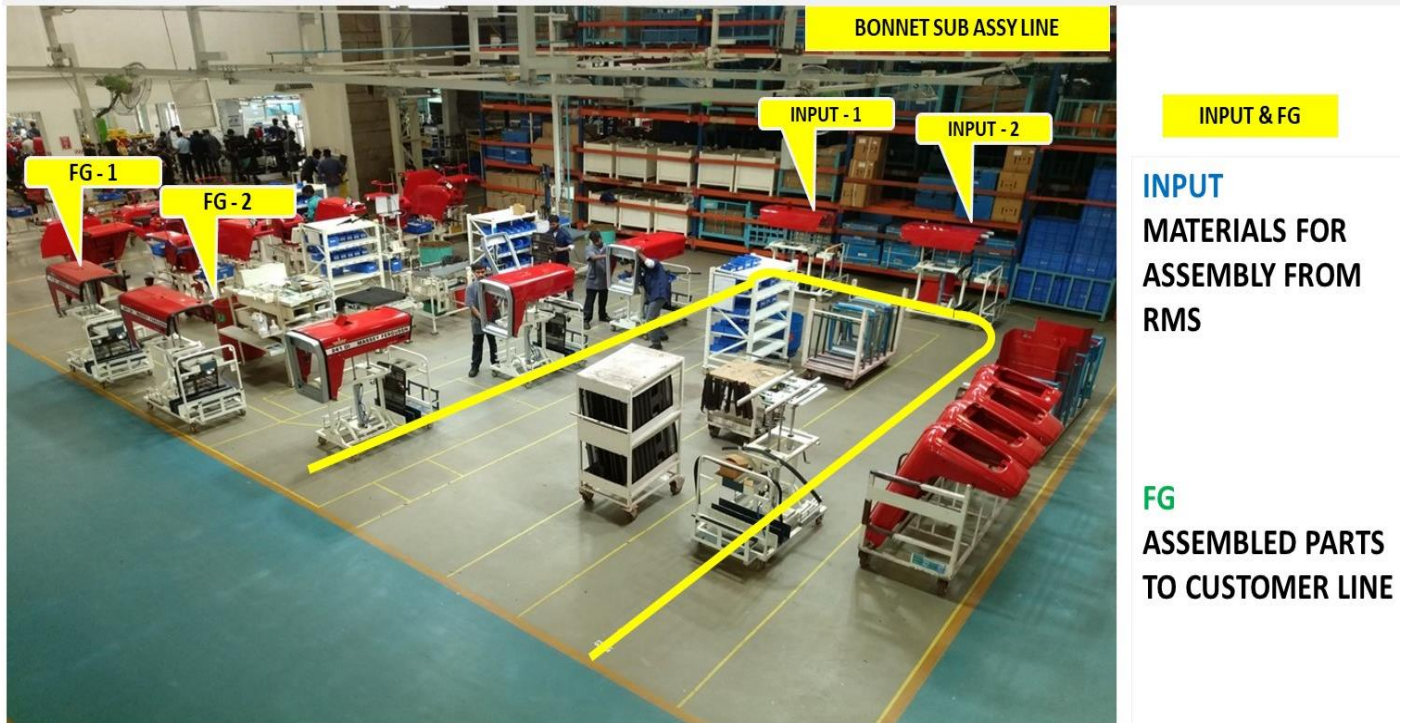


Production Flow

Methodology to produce different tractors ONE by ONE:

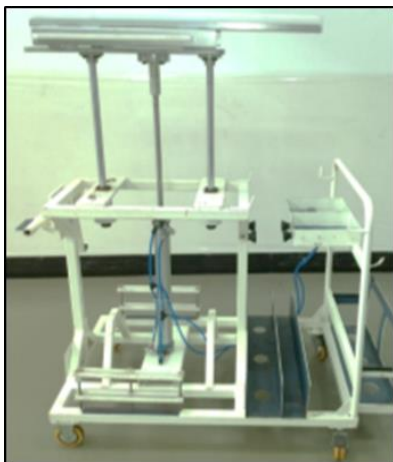


U Shape Sub assembly Layout:



Design kitting trolley cum mobile fixture:

Mobile Fixture



Mobile fixture with parts for assembly



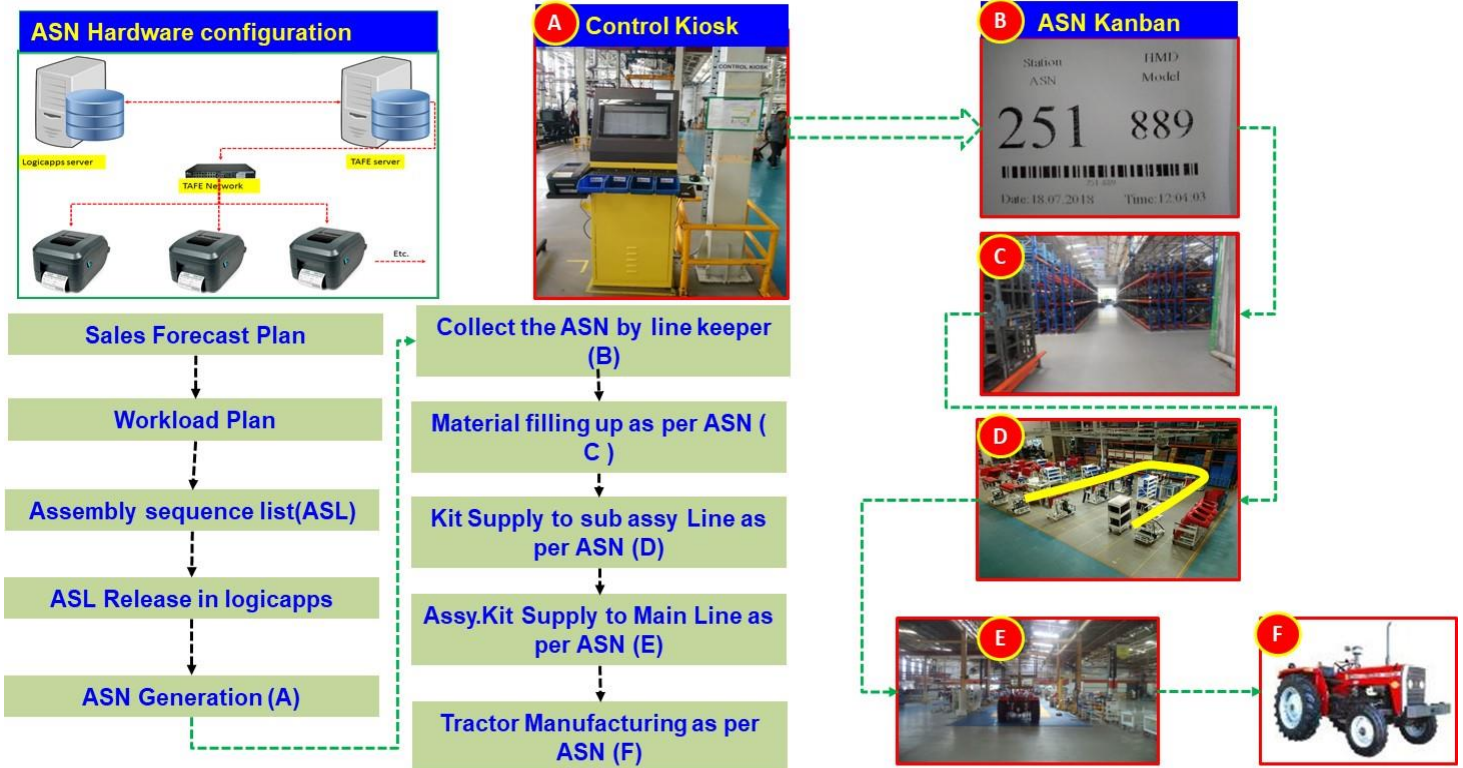
Mobile fixture with assembled hood



Digital enablement:

In the old assembly methodology, the continuous sequence was released to the assembly line through a LED board, where in there were issues to identify which sequence number in which stage of the assembly, thus creating confusion to parts supply team and the operator.

In the new methodology of digital enablement an Assembly Sequence List (ASL) and Assembly Sequence Number (ASN) was generated based on the Heijunka plan released and barcode stickers were printed for the production line.



Methodology to train operator:

1. Activity Sheet (Capture hand time and walk time)
2. SWCD (Standardized work combination diagram)
3. SWC (Standardized work chart)

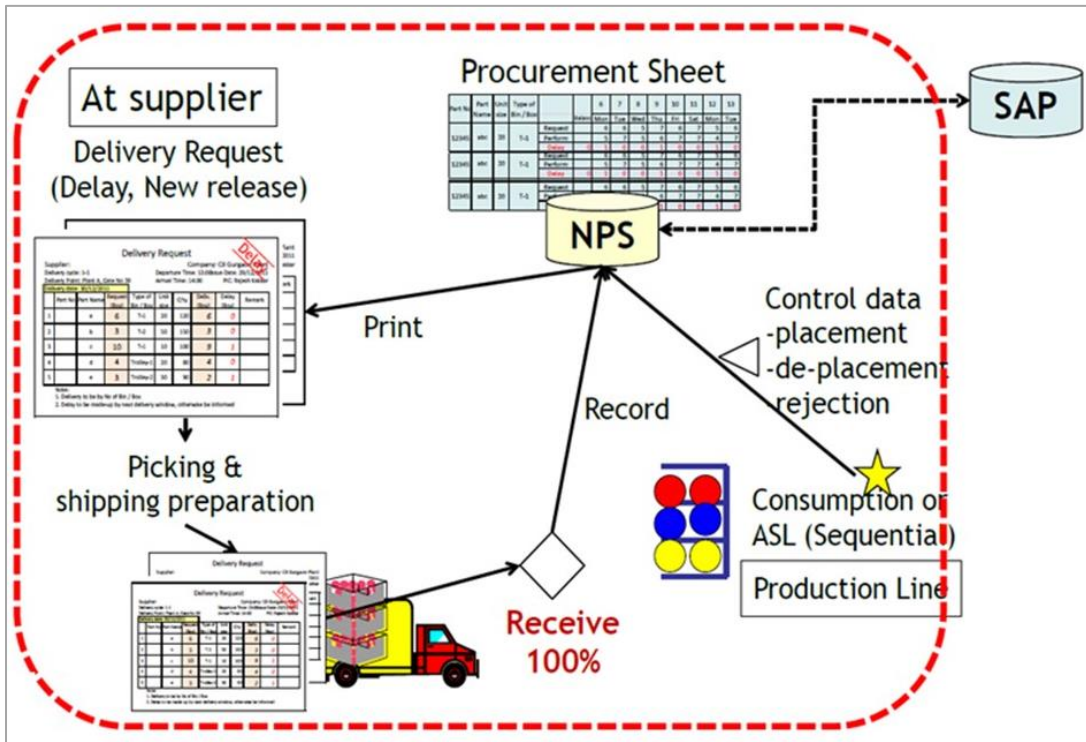
Activity List		Standardized Work Combination Diagram (SWCD)		Standardized Work Chart (SWC)	
Activity	Hand Time	Activity	Time	Activity	Time
1. Prepare workpiece	0.15	1. Prepare workpiece	0.15	1. Prepare workpiece	0.15
2. Tighten engine housing	0.15	2. Tighten engine housing	0.15	2. Tighten engine housing	0.15
3. Place component	0.15	3. Place component	0.15	3. Place component	0.15
4. Tighten nut	0.15	4. Tighten nut	0.15	4. Tighten nut	0.15
5. Tighten engine housing	0.15	5. Tighten engine housing	0.15	5. Tighten engine housing	0.15
6. Tighten nut	0.15	6. Tighten nut	0.15	6. Tighten nut	0.15
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Procurement Flow:

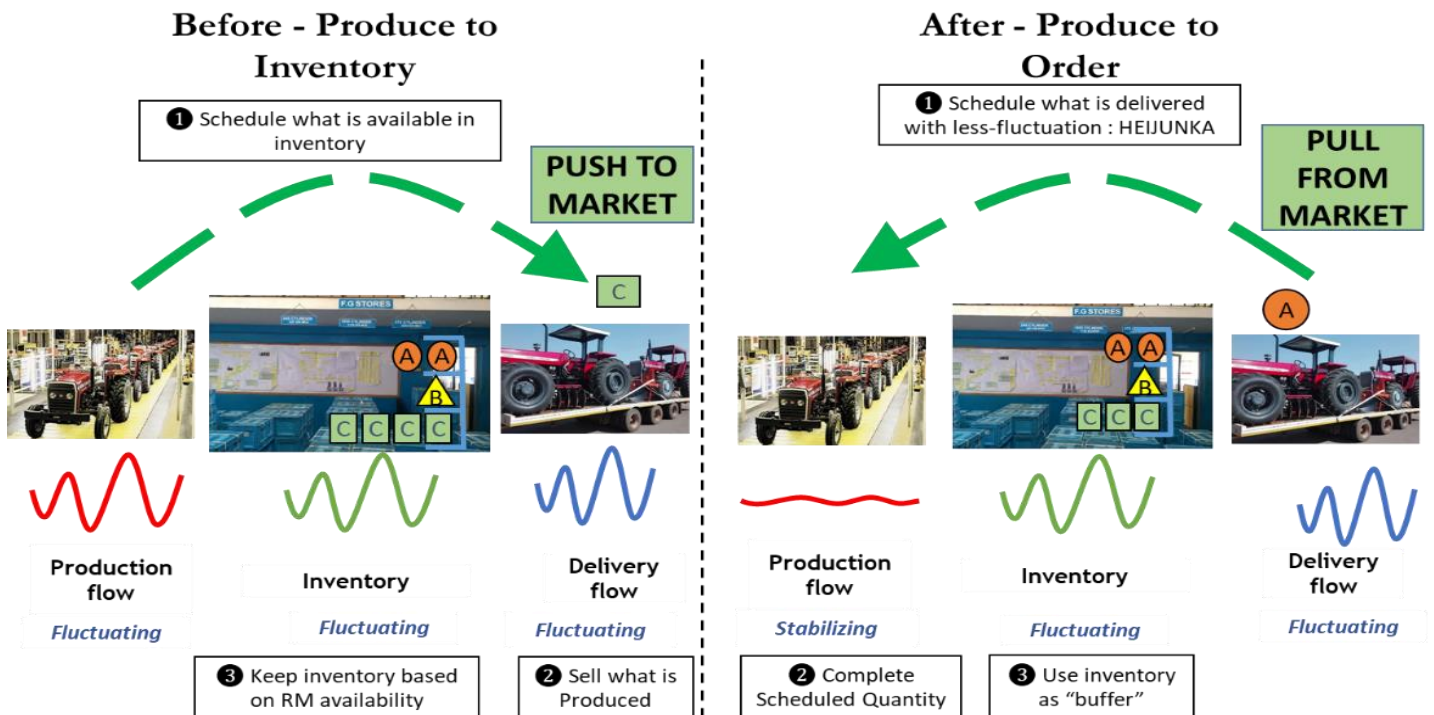
New Procurement System (NPS):

- As the production plan is shifting from forecast base to sale based, the procurement cannot continue as per forecast. The New Procurement System will enable the consumption-based procurement based on production which will bring in total synchronization and offers the following benefits.
- Velocity: - Converting of information from Production flow to Procurement Flow
- Standardization: - Delivery request to ensure 100% completion of schedule
- Visibility: - Taking corrective action based on delay which is visible on the top

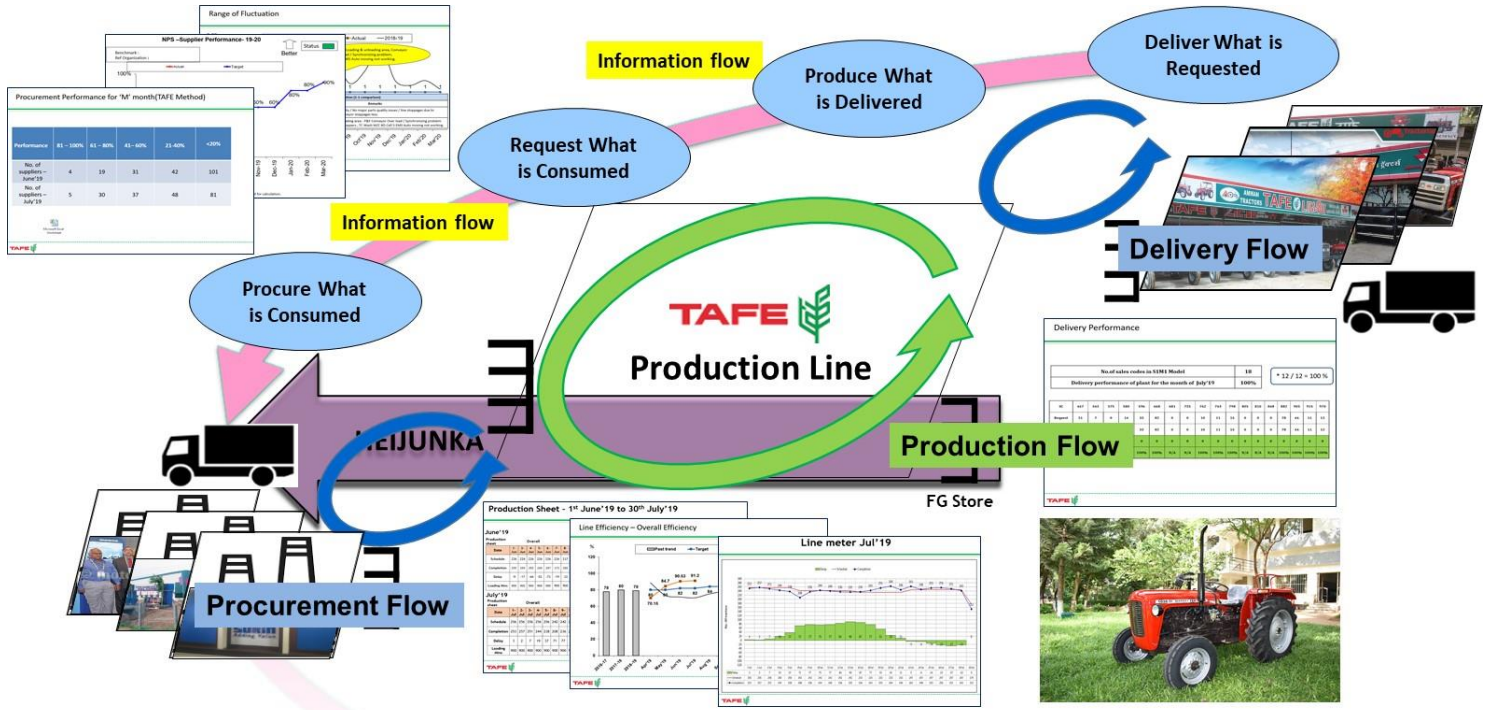
Flow of New Procurement System:



Difference between traditional & Synchron Way of procurement:



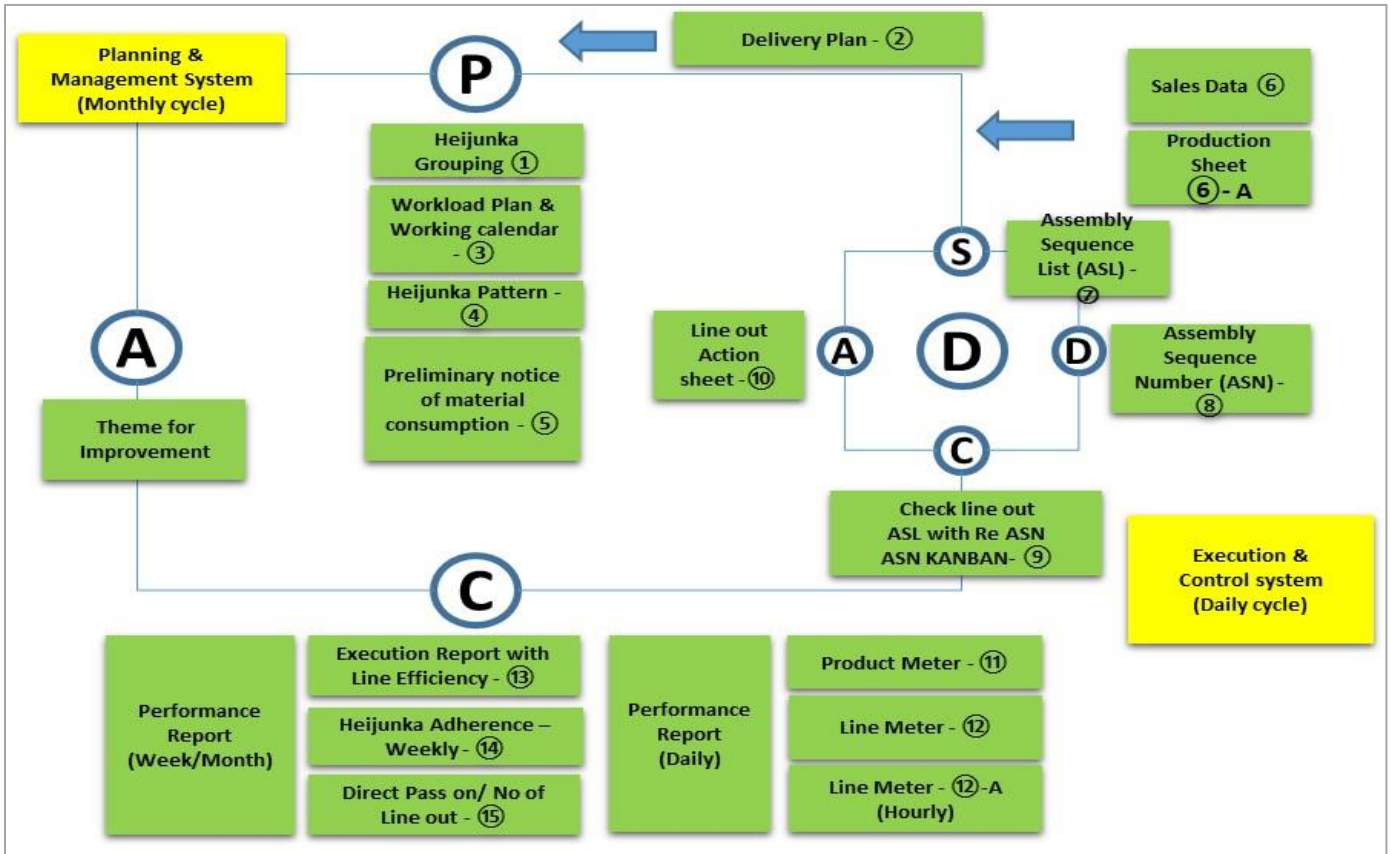
Transformation of Three Flows:



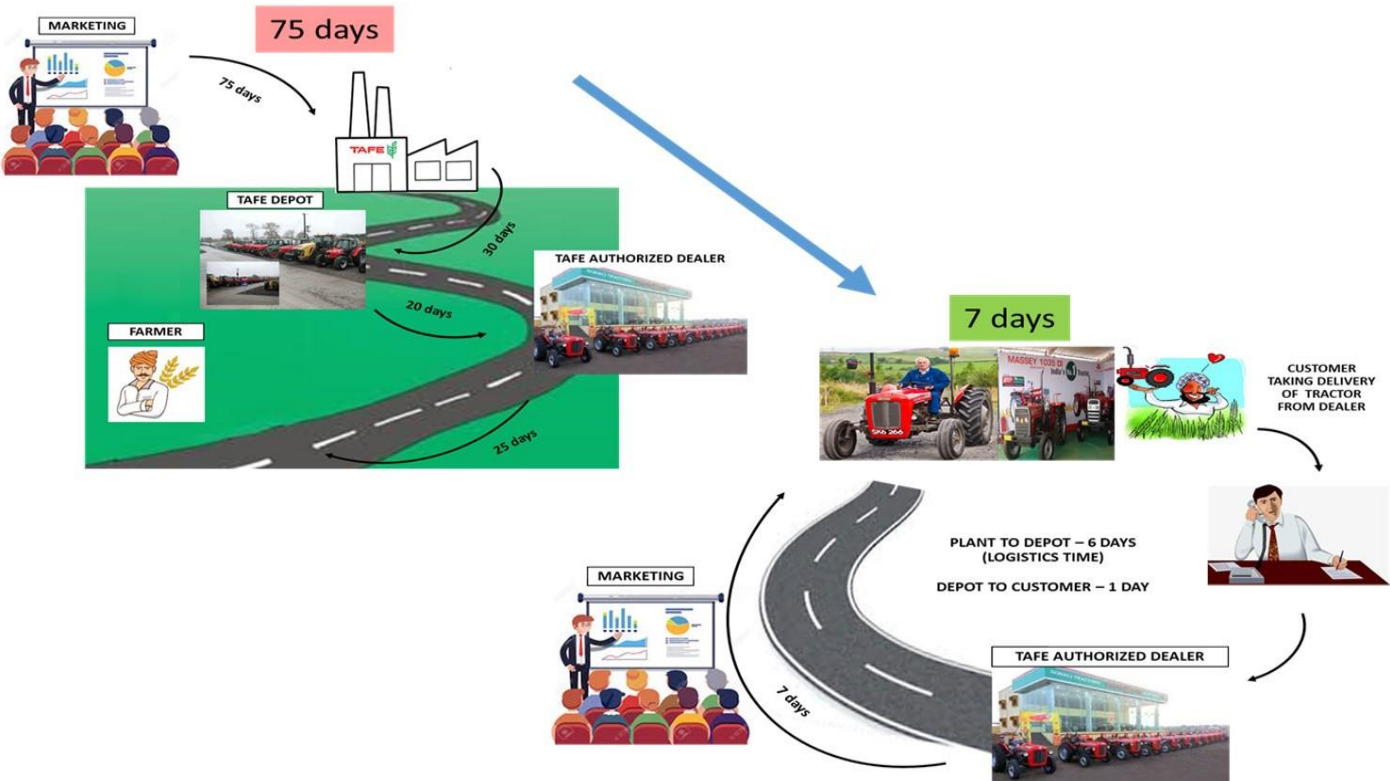
New TAFE Production System – Sell One Make One (S1M1):



Overall Flow:



Delivery lead time from plant to dealership is reduced from 75 days to 7 days:



Results:

