

Lean Manufacturing for Competitive Advantage

C.Narasimhan

Sundaram-Clayton Limited

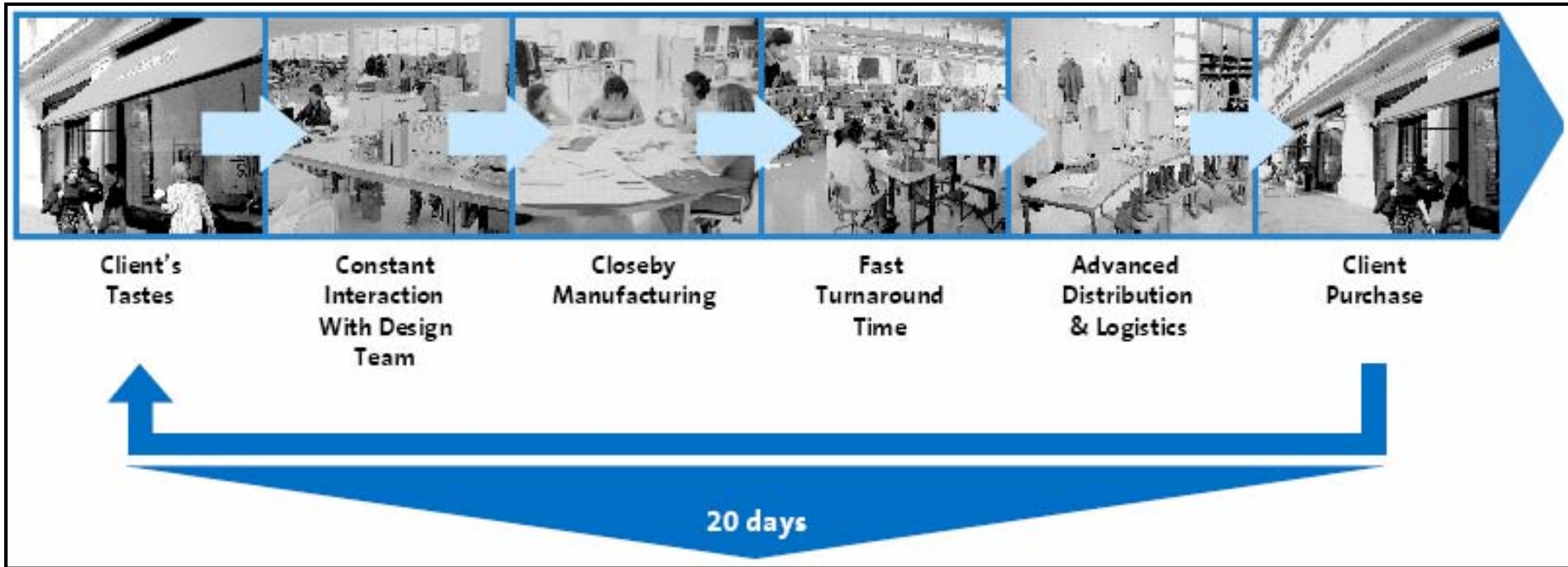
Presentation overview

- **Lean : A competitive weapon**
- **What is lean?**
- **Experience from SCL**
- **Advantage India**

Lean: A Competitive Weapon

Zara: Fastest turnaround time

Freshly baked clothes: Consumers will regard clothes as perishable commodity...



ZARA

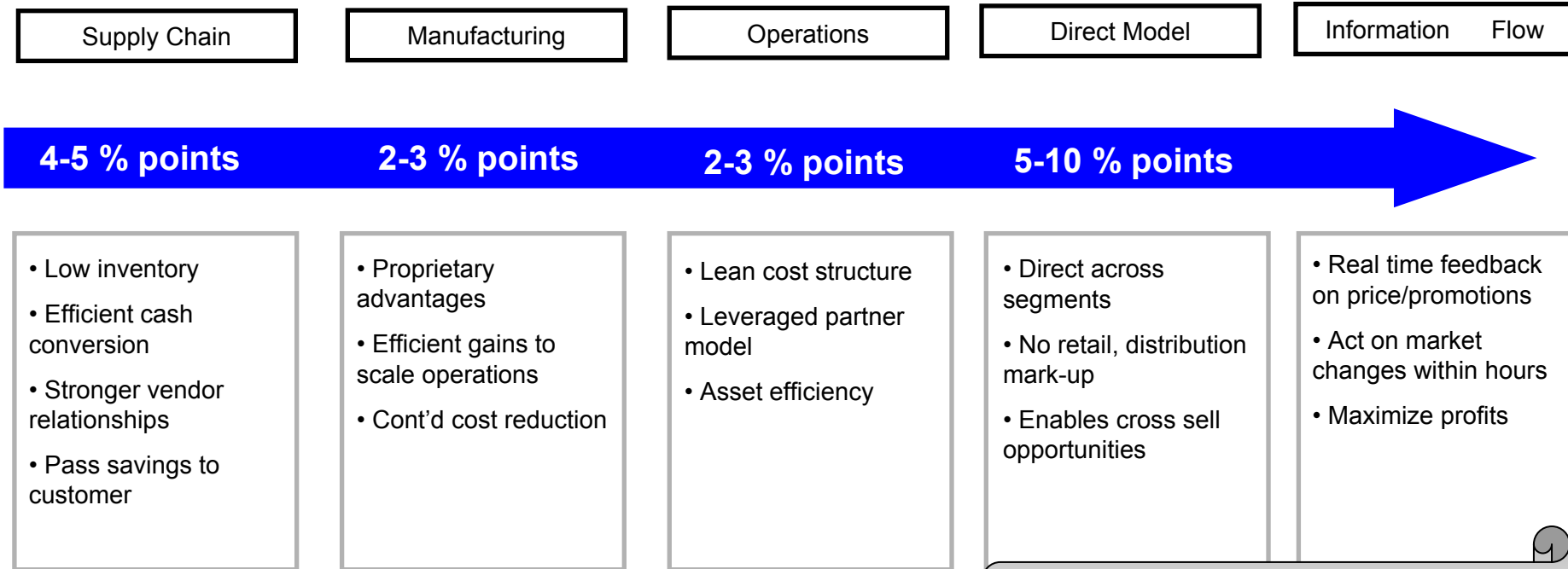
Short lead time

Small batch quantities

More variety

Business Model: Dell

Cost advantage:



Strong information flow
Direct access to customers
Lean operations, supply chain

Southwest: One Kind of Airplane



No going through hubs.

The planes fly direct to where you want to go, not where Southwest wants you to change planes.

Flying the shortest distance between two points saves fuel and time, so the airline charges less. It's that simple.

No lousy food.

In fact, no food at all. What you save on Southwest, you can spend at a gourmet restaurant when you arrive.

No loading of food keeps things simple.

No assigned seats.

Just reusable boarding passes. That means no groping for seats, no boarding early, no overbooking.

You walk on and the plane takes off. You arrive on time.

What could be simpler?

Walkman re-invented

Product obsession



20th Century Walkman
20 songs

Consumer obsession



21st Century iPod
20,000 songs



Observes: People sharing music

Insight : Young people love unlimited access to music

Barriers : Storage devices, Cost

- October 23, 2001

i-dea

Jan 9, 2001: launches i-tunes





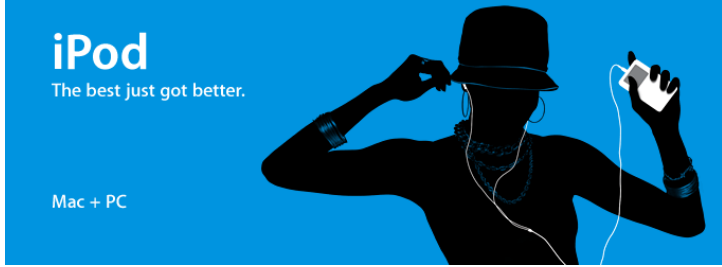
iPod mini

A thousand songs.
Five cool colors.



iPod shuffle

Give chance a chance.



iPod

The best just got better.

Mac + PC



i-dea grows



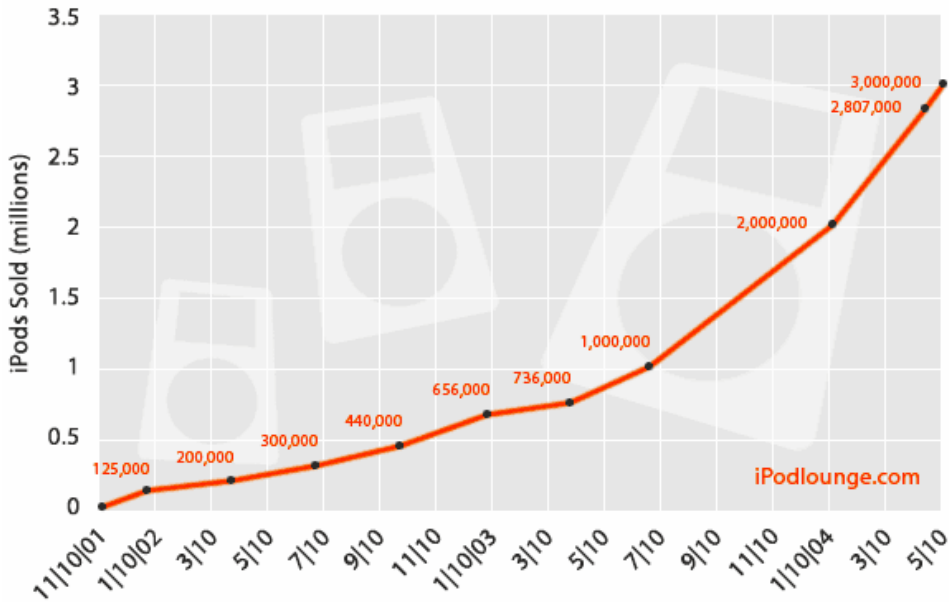
- FireWire port *
- Headphone port
- 'Hold' Switch
- Scroll Wheel
- Touch Wheel
- Touch/Click Wheel

1G iPod 2G iPod 3G iPod iPod mini

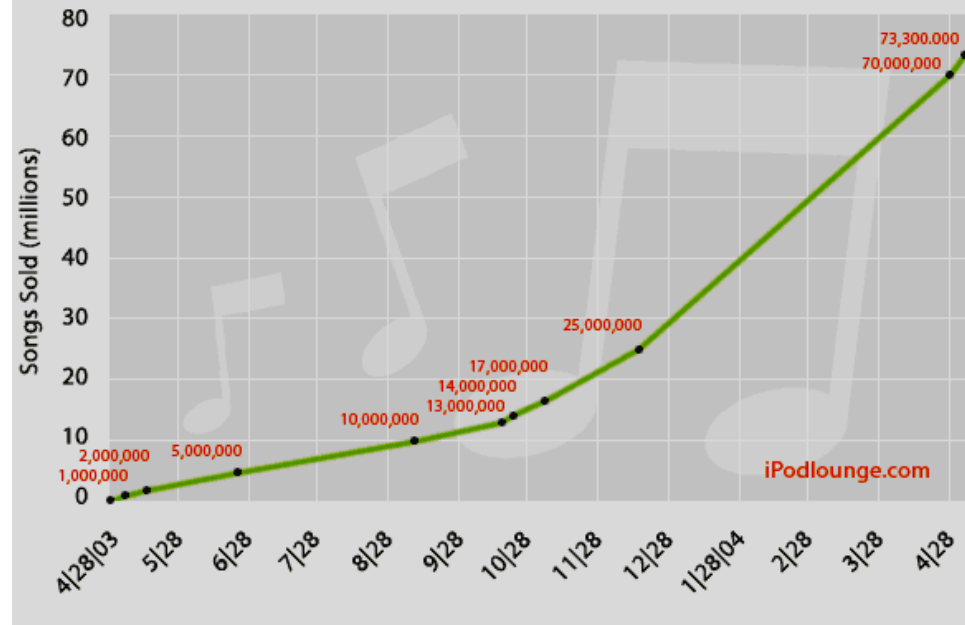
* 3G iPod and iPod mini have FireWire/Dock connector on bottom



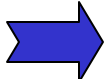
Sales of iPods



Sales of iTunes Songs



Mumbai's Dabbawala's

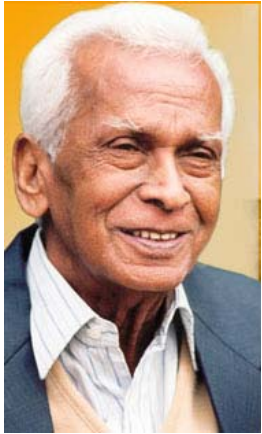
5,000 tiffinwals's  175,000 lunches



1 error in 16 million transactions = 99.999999% times correct

Only for Rs.150 / month

Aravind Eye Hospital



Dr.G.Venkataswamy

**Alternate health care model
supplementing Governmental efforts**



Started 1976 with 11 beds, Currently 4 hospitals with 3590 beds
67% of outpatients visit & 75% of surgeries free of cost



Free eye camps

Free cataract surgeries



World class ophthalmic products available at affordable costs

Institute for research that contributes to the development of eye care

Development and implementation of efficient and sustainable eye care programs

World's most productive eye hospital!!

Telecom revolution in Rural India



STD/ISD/PCO stations



Phones in post offices in villages



Mobile phones

MeTel – Low cost e-mail for rural India



Banking



Banks



ATM's in cities



**Low cost technology
for rural India
by TeNet Group**

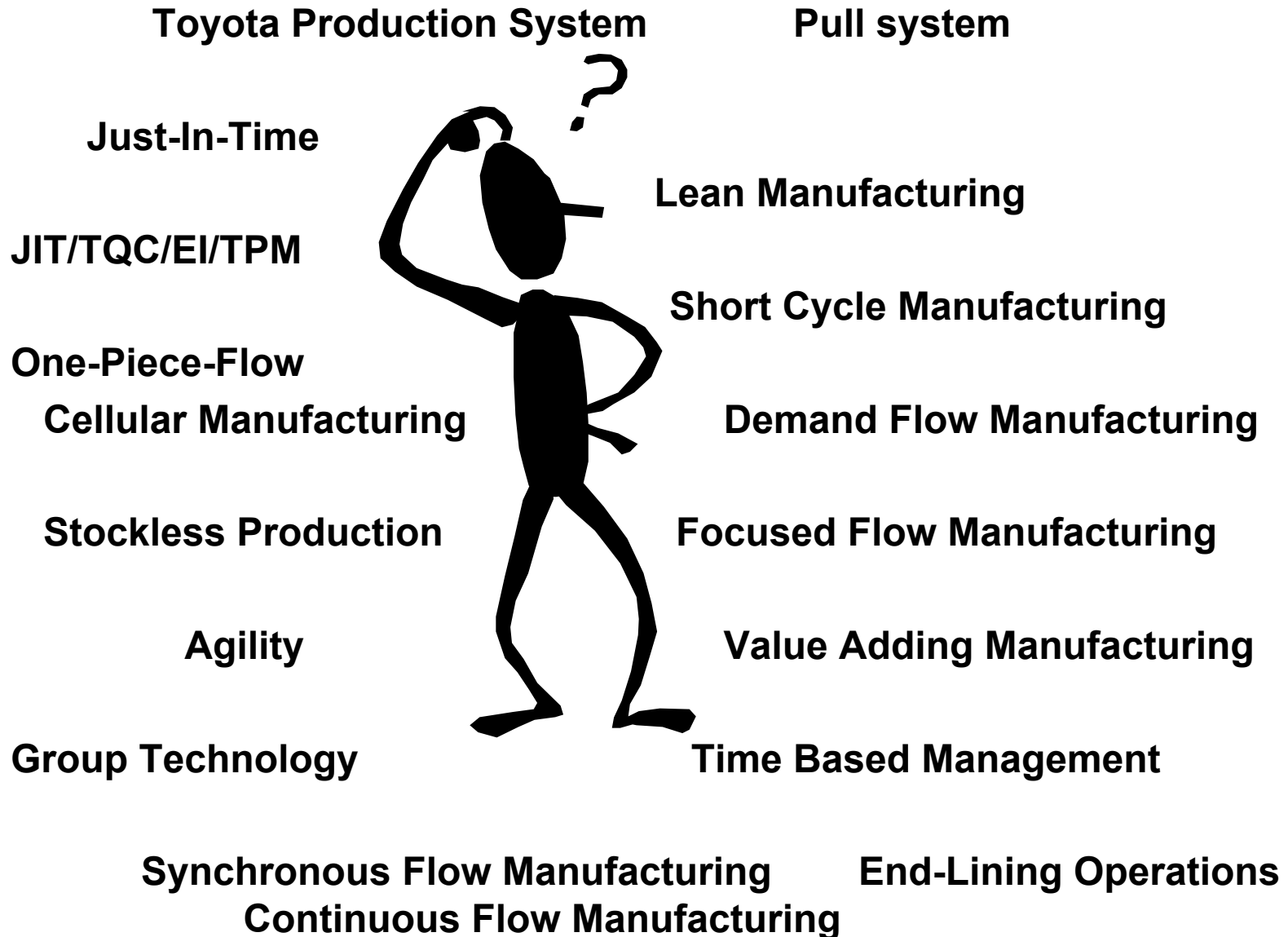
Key Success Factors

- Create Value for the customer - Innovate
- Reduce development time - Speed to Market
- Improve Asset Productivity – Man & Machines
- Reduce Inventory
- Reduce Cost
- Offer world-class Quality & Service
- Reach customers across the depth of the Country

LEAN – The only way to go!!

What is Lean?

Many Names, but the same Concept



LEAN defined...

- Philosophy which seeks to provide more and more value to the customer (package of cost, quality & delivery) with less and less resources by eliminating waste (Muda)

Overriding Principle :

by

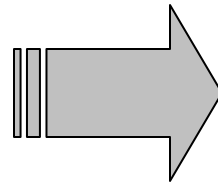
Adding Value, Removing Waste

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MUDA

- Waste (MUDA) is anything that does not add value to the product from the customer's perspective (e.g. excess inventory, over production, over investment, excess handling, etc.)

MUDA



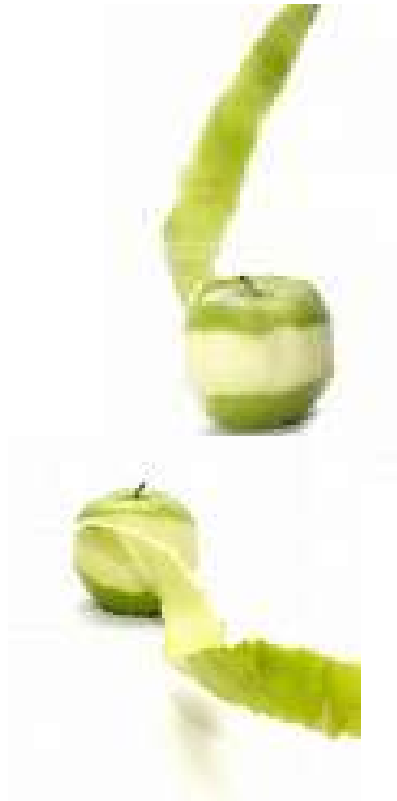
Overproduction
Inventory
Transportation
Extra Processing
Defects / Rework
Unnecessary Motion
Unnecessary Waiting

Things to remember about waste

- Waste is really a symptom rather than a root cause of the problem
- Waste points to problems within the system(at both process and Value-stream levels)
- Find and address cause of waste

The element of production that add no value to the product. Waste only adds cost and time.

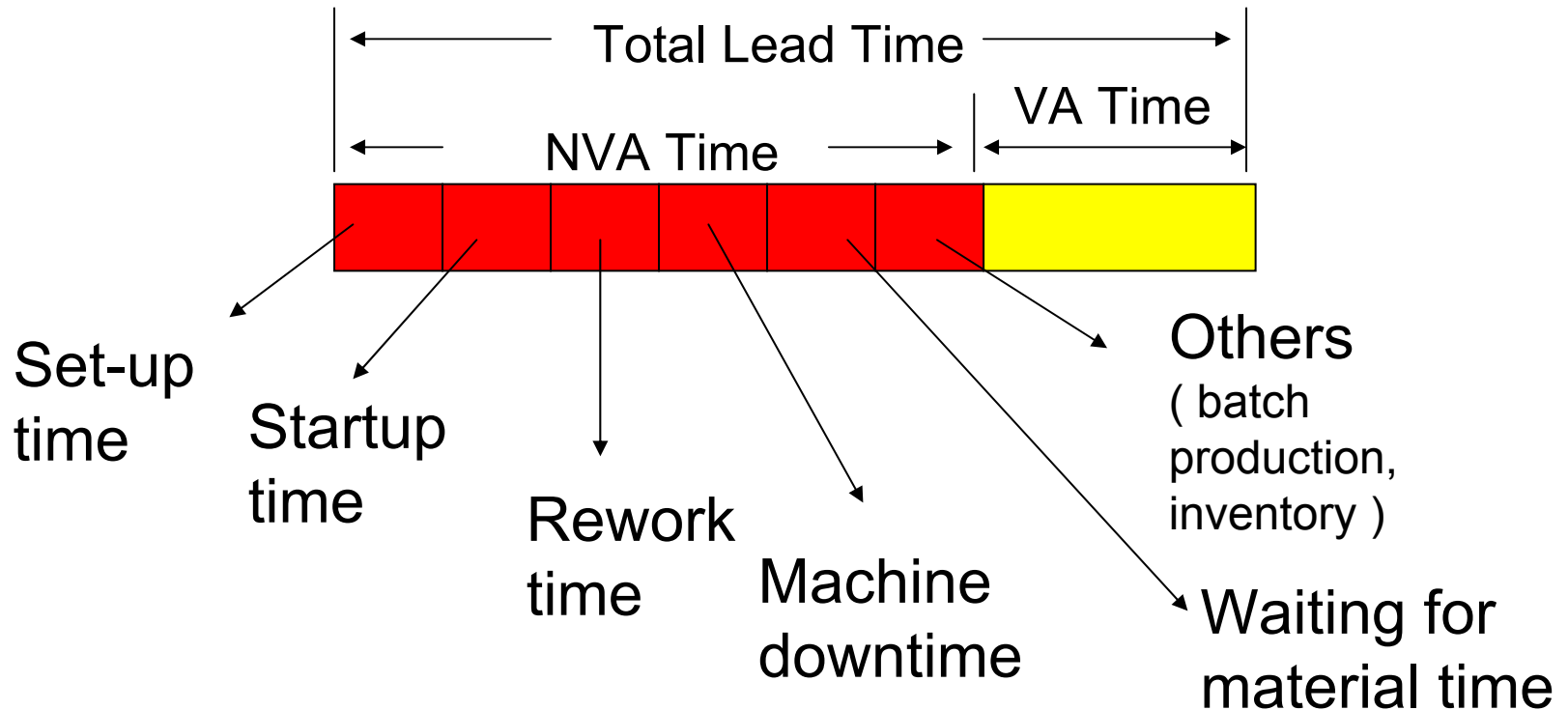
Why Lean ?



Nothing / Nobody is perfect. Even NATURE!!!

Why Lean ?

Typically 95% of Total Lead Time is Non Value Adding !!



Focus is on reducing NVA Time to improve overall efficiency

Company-wide Lean ?

- Asset utilization
- Manpower utilization
- Low cost automation
- Balance to TAKT time working
- Lean inventory

Benefits of Lean

- **Turn Sales Orders into Profits as Quickly as Possible**
Decrease the time period from buying or fabricating components until you get paid by the customer for the finished product.
- **Increase Profits**
Reduce Costs and Increase Sales.
- **Use Limited Resources Wisely**
People, Equipment, Buildings, etc.

Some experiences from SCL

Why SCL went for Lean?

- From 1998 onwards our customers demanded
 - Daily supplies with zero defect
 - Supplies in matched vehicle sets
 - Continuous price reduction
- To meet the above requirement, SCL needed to
 - Respond in short lead times
 - With less inventory and investment
 - Eliminate waste and reduce cost
- Since lean manufacturing addresses above requirements, SCL decided to implement Lean Manufacturing in the production system

Our objective

- To reduce lead time from customer order to delivery of products
- To meet the customers changing requirement
- To reduce inventory by implementing pull system and Just-in-time supplies
- To achieve zero defect
- To improve productivity

Case 1: Dual Brake Valve

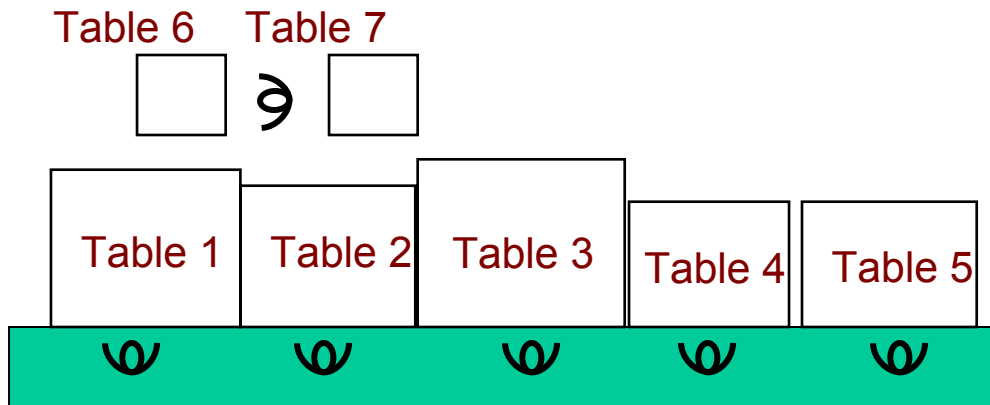


Table 1 - Upper body sub-assembly and primary piston assembly

Table 2 - Lower body sub-assembly and upper body & primary piston assembly

Table 3 - Upper and lower body assembly and exhaust flap assembly

Table 4 - Testing

Table 5 - Final assembly

Table 6, 7 - Intermediate testing

**2 cells for the same product,
Productivity – 3.3 units / operator / hour**

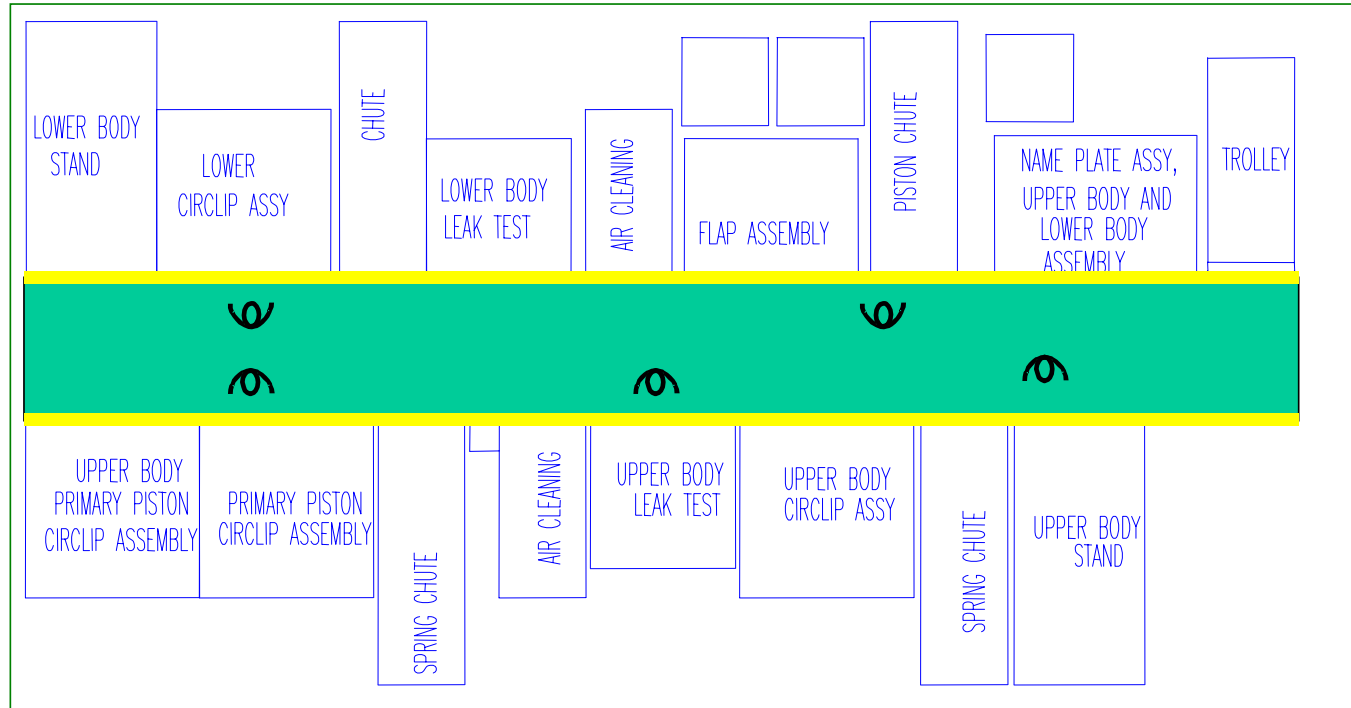
Cell 1



Cell 2

Case 1: Dual Brake Valve

Improvement - Phase I

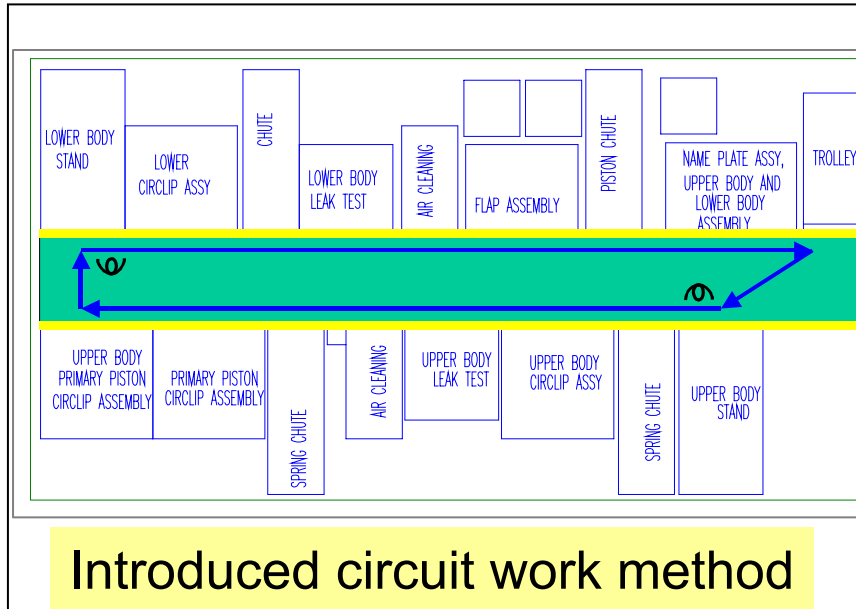


Major actions:

- Man-machine balancing
- Improvement in pace and rhythm of working

Case 1: Dual Brake Valve

Improvement Phase-II



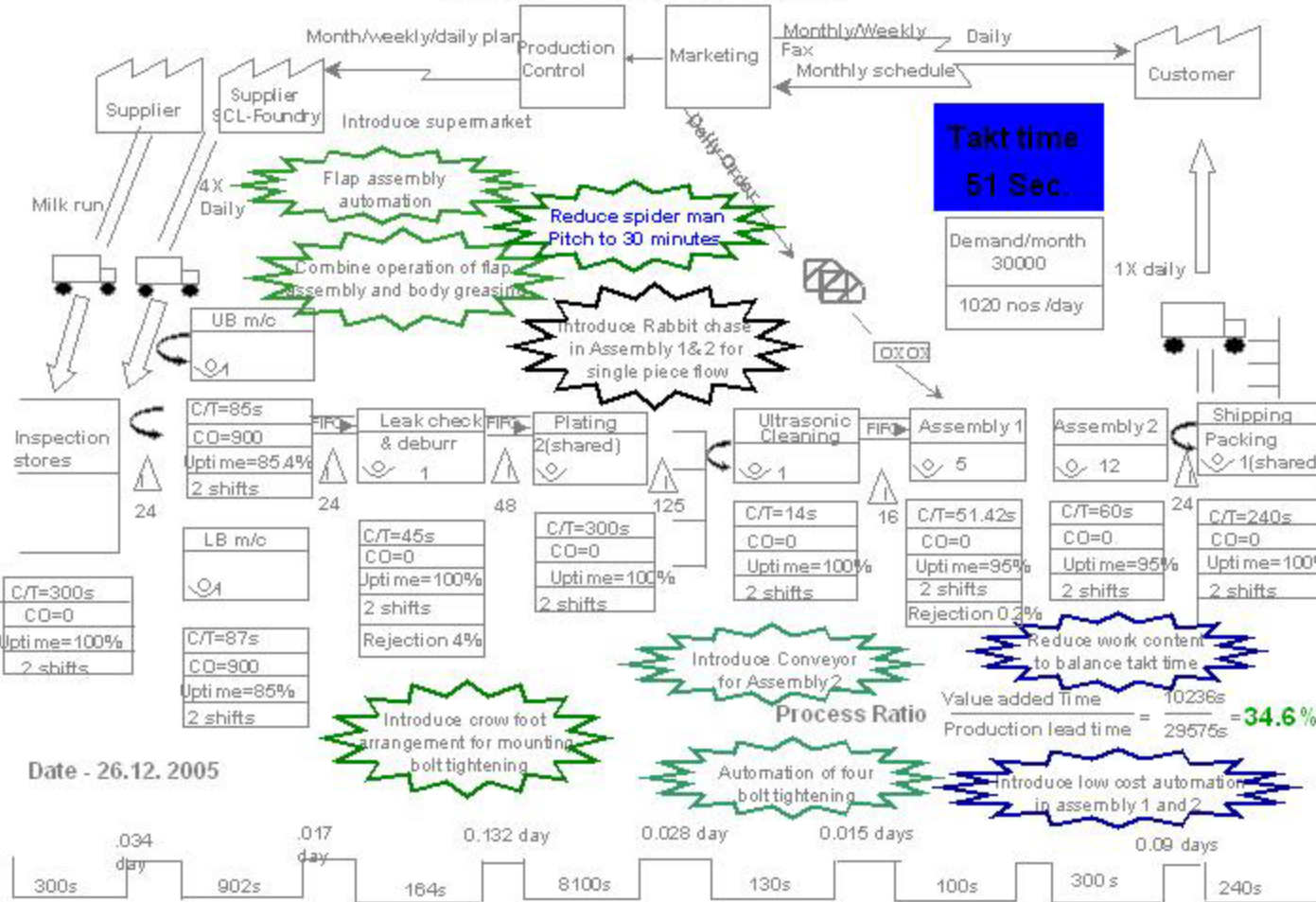
Major improvement

1. Circuit work method introduced – to eliminate imbalance
2. Low cost automation
3. Multi process operation introduced
4. On the job training (OJT) to workmen

**Productivity improved
by 500%**

Case 1: Dual Brake Valve

Value Stream mapping



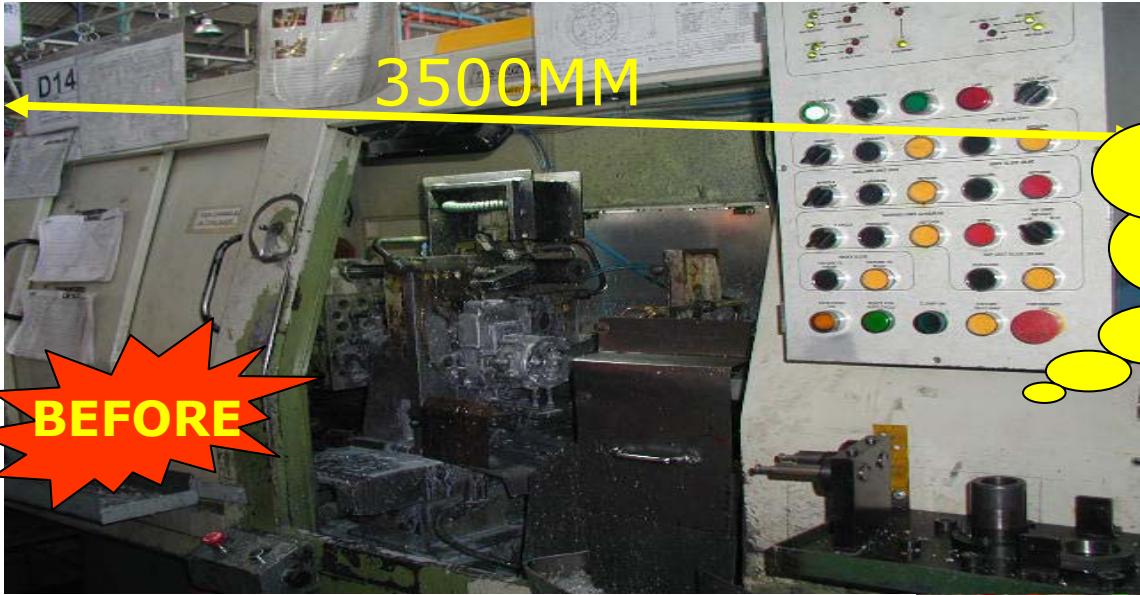
Process ratio
 Before – 2.6%
 Now – 35%

Case 1: Results

Effect of improvement

| No | Description | UOM | Before | After |
|----|----------------------------|---------|--------|-------|
| 1 | Number of cells | Nos | 2 | 1 |
| 2 | Number of operators/ shift | Nos | 12 | 3 |
| 3 | Output/ hours (Nos) | Nos | 40 | 60 |
| 4 | Output/ hour/ opr./ cell | Nos | 3.3 | 20 |
| 5 | Employee productivity | % | | 501% |
| 6 | Space | Sq. Mts | 25 | 18 |
| 7 | Space productivity | % | | 39% |

Case 2: Lean machine



- ❖ HIGH FRONTAGE
- ❖ MORE WALKING DISTANCE
- ❖ DIFFICULT MAINTENANCE
- ❖ MORE COMPLEX

3. Low Machine Frontage , Less Walking Distance

- ❖ LOW FRONTAGE
- ❖ LESS OPERATOR WALKING DISTANCE
- ❖ EASY MAINTENANCE
- ❖ LESS COMPLEXITY



Case 2: Results

| Sl. No | Description | UOM | Before | After | Improvement |
|--------|-------------|----------|--------|-------|-------------|
| 1 | Frontage | Mtr | 3.5 | 2.4 | 31% |
| 2 | Floor space | Sq. M | 10.5 | 5.3 | 50% |
| 3 | Cost | Rs. Lacs | 30 | 20 | 33% |

Case 3: Process Plant

Year - 2000

Year - 2003



9 m



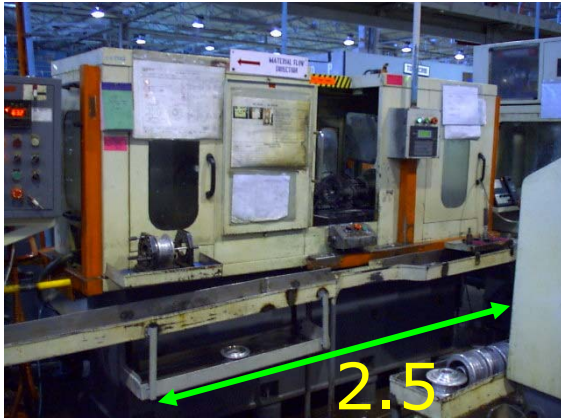
6 m

BENEFITS

| SI No | Description | UOM | Before | After | Improvement |
|-------|---|----------------|--------|-------|-------------|
| 1 | Frontage | m | 9 | 6 | 33% |
| 2 | Floor area | m ² | 54 | 30 | 45% |
| 3 | Cost | Lacs | 21 | 17 | 20% |
| 4 | Electrical load | kw | 45 | 30 | 33% |
| 5 | Plant running cost(Excluding consumables) | Rs/hour | 225 | 150 | 33% |

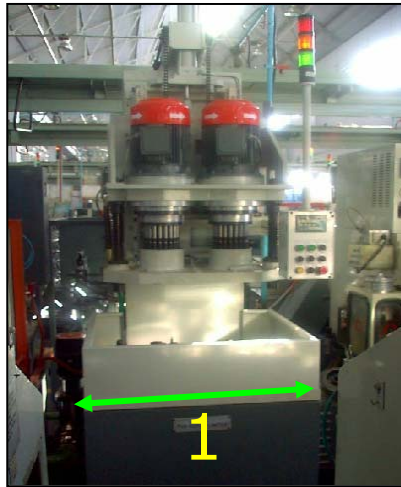
Case 4: Zero Changeover

**Horizontal
Single model
1996**



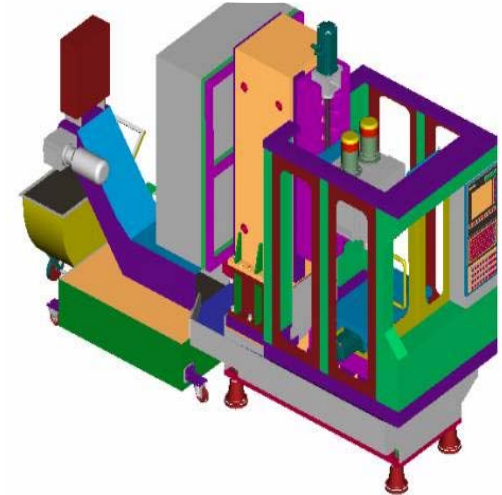
No of spindle - 36
Hydraulic control

**Vertical
Single model
2000**



No of spindle - 36
Hydraulic control

**Vertical
Multi model
2003**



No of spindle - 2
CNC Control

BENEFITS

| SI No | Description | UOM | Horizontal | Vertical | Vertical | Improvement |
|-------|------------------|-----|------------|----------|----------|-------------|
| 1 | Modle | | Single | Single | Multi | |
| 2 | Frontage | m | 2.5 | 1 | 1 | 60% |
| 3 | Floor space | m2 | 5 | 3.3 | 3.3 | 34% |
| 4 | Cost | m | 19 | 18 | 14 | 26% |
| 5 | Tool change time | min | 54 | 54 | 3 | 94% |

Case 5: Low cost automation

BEFORE



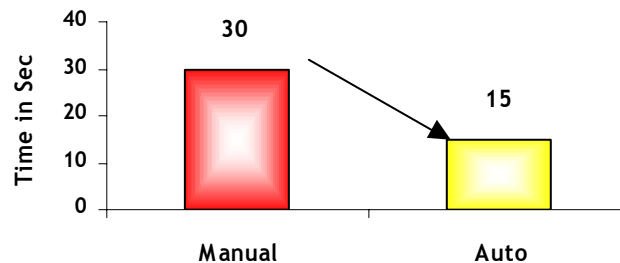
Manual deburring

AFTER



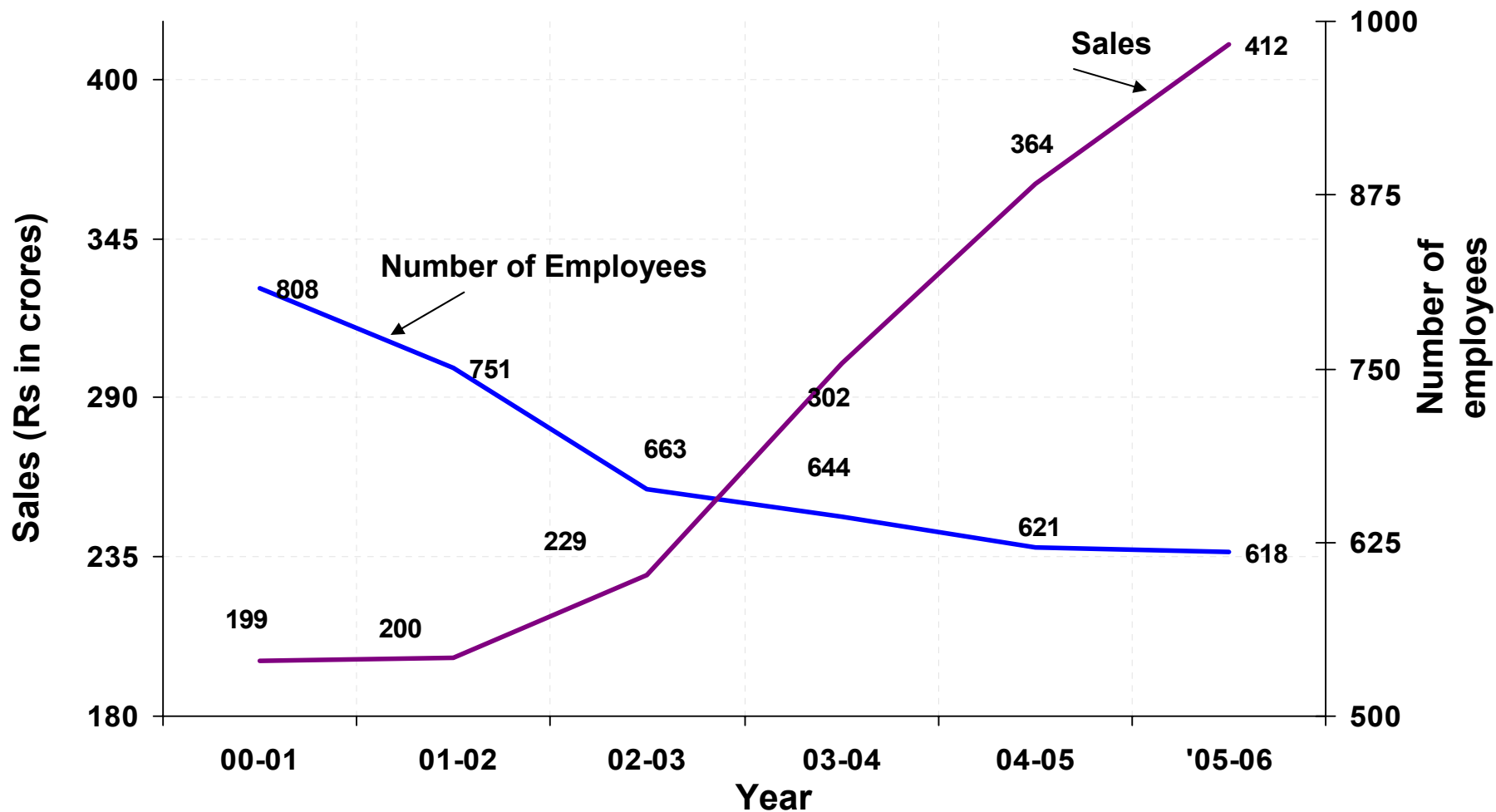
Auto deburring setup

SMS Reduction (Manual Vs Auto)



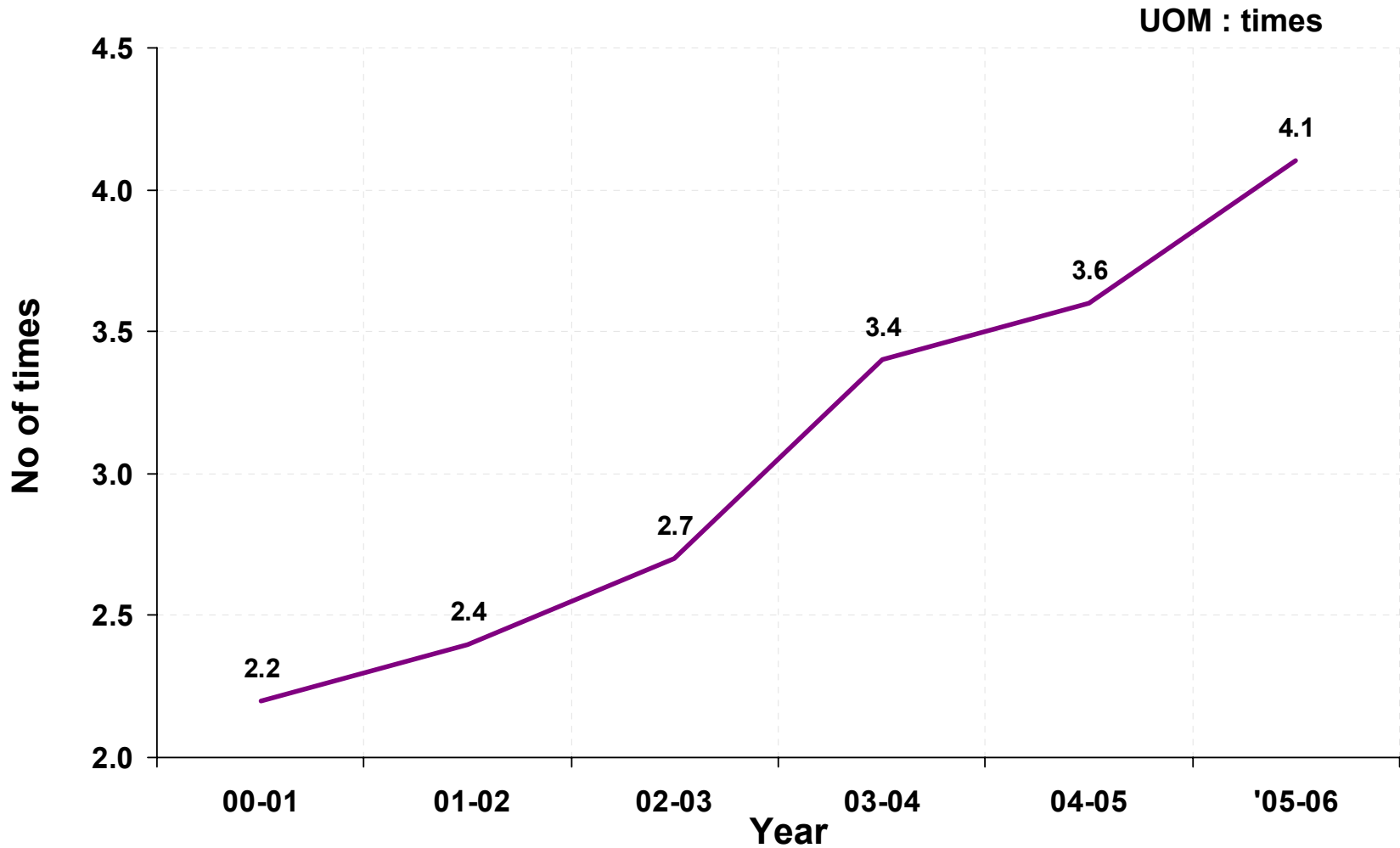
Results

Sales Vs Manpower



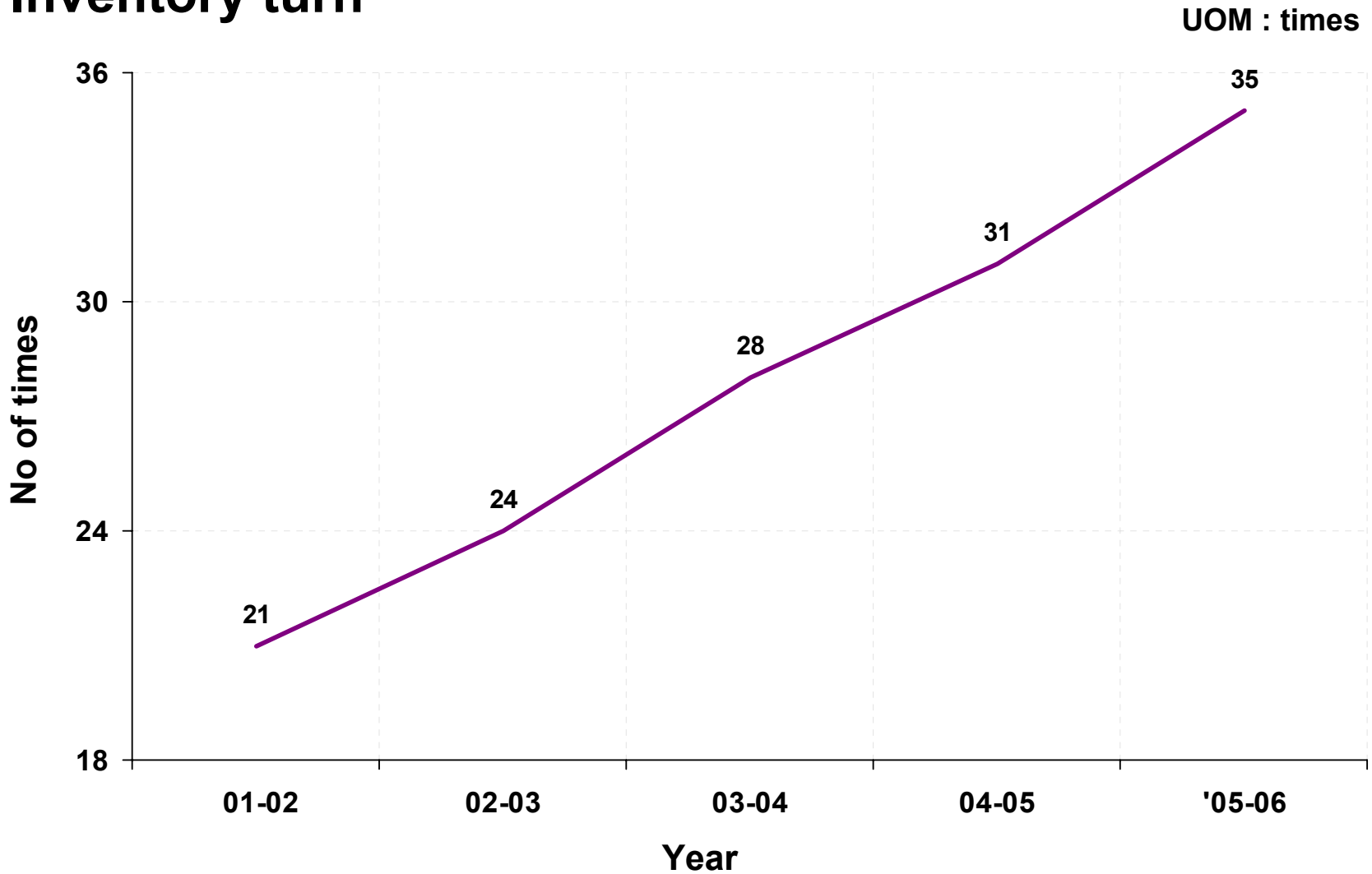
Results

Sales to Gross fixed assets



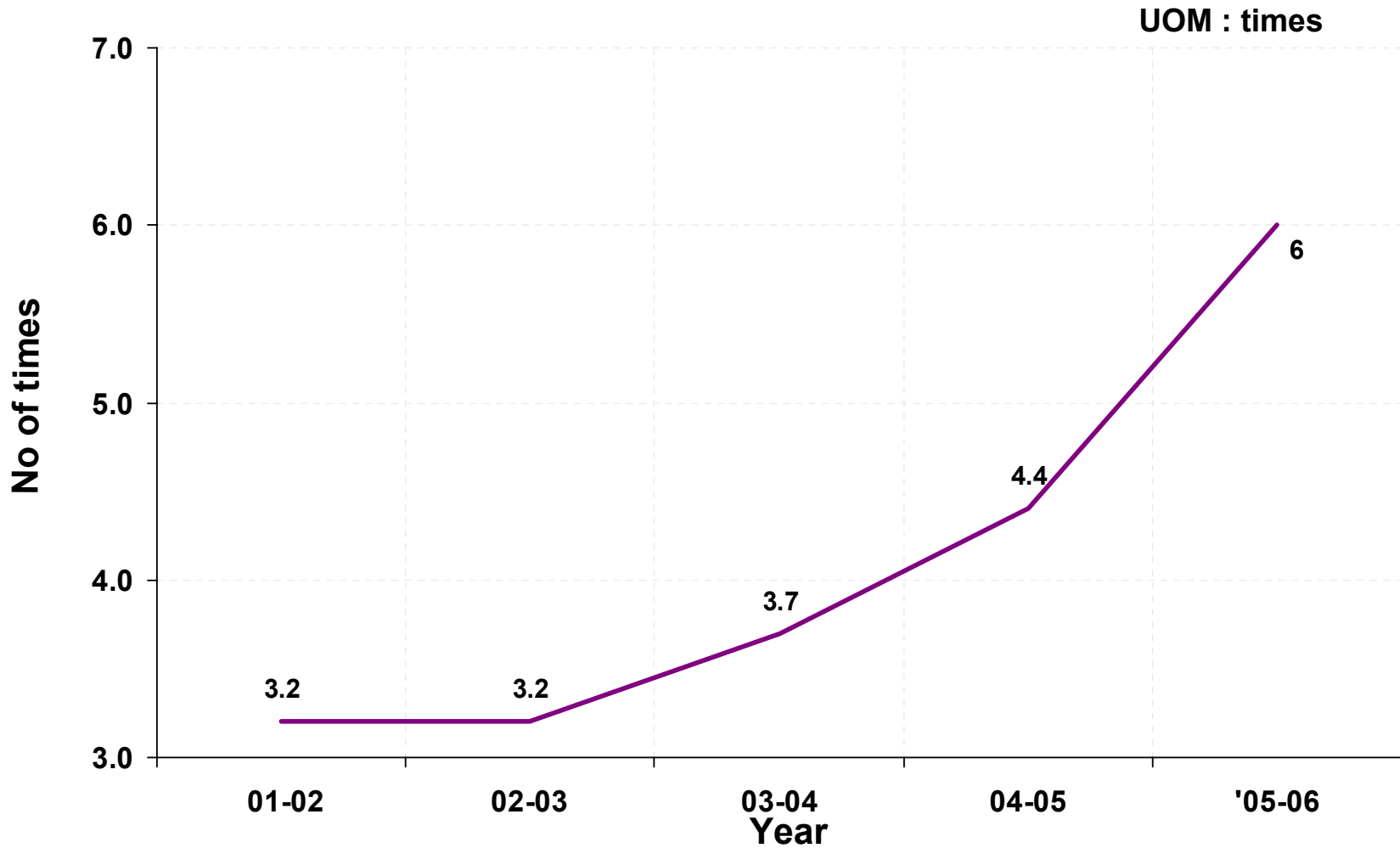
Results

Inventory turn



Results

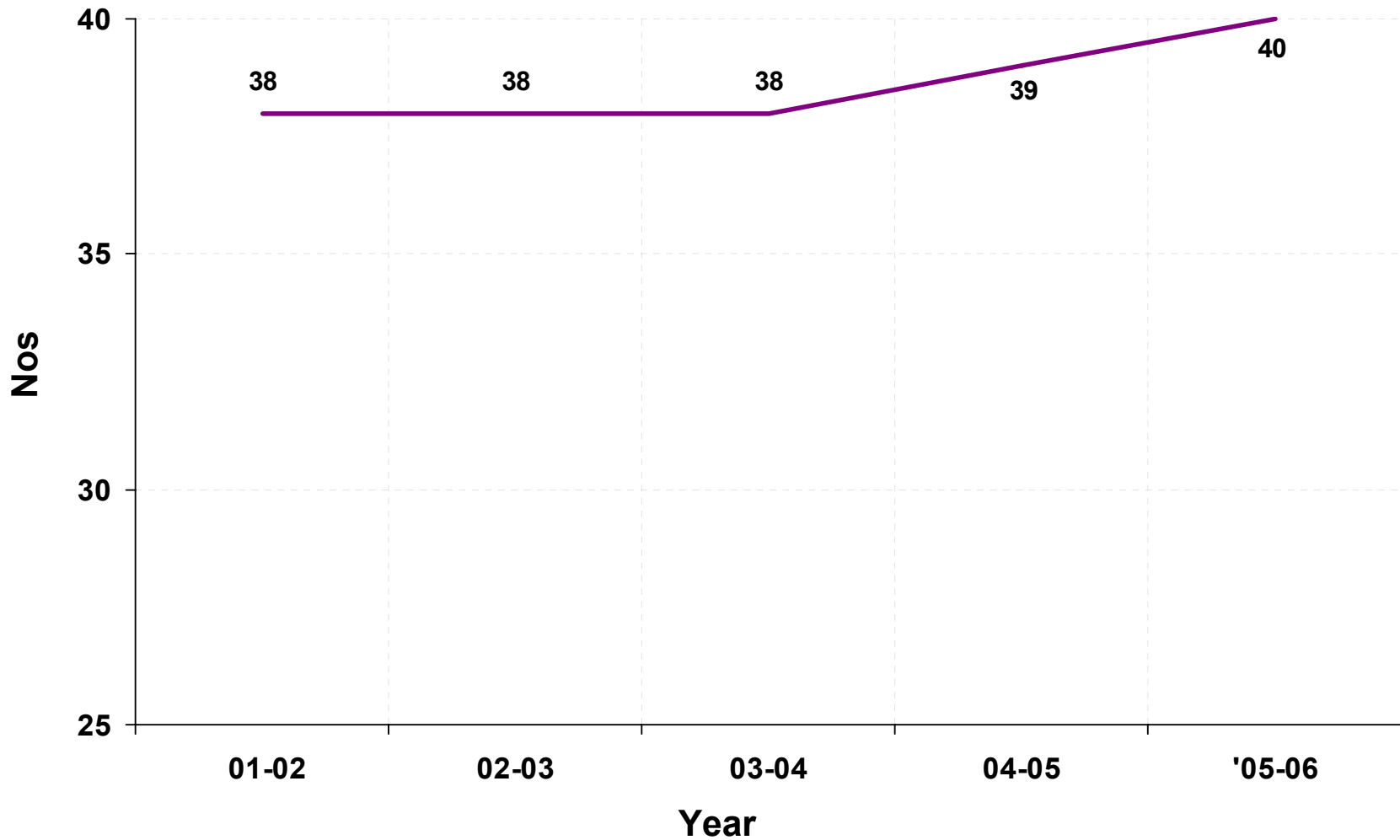
VAPCO



Results

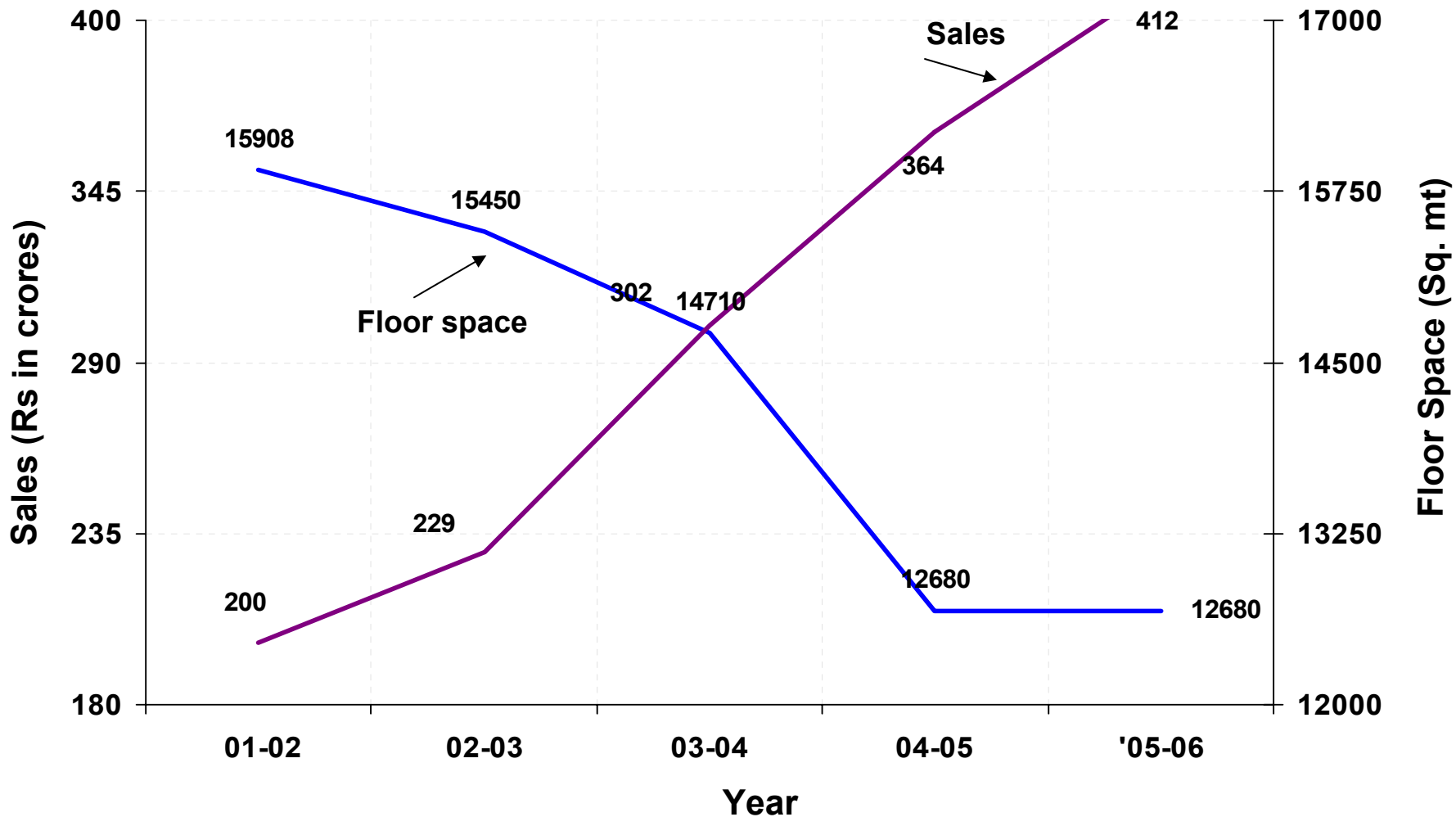
Suggestions / employee

UOM : Nos/employee



Results

Sales Vs Floor space



Where this has got us @ SCL

- Lowest cost producer of Air Compressors (for HCVs) in the world
- 100% on-time-delivery to customers for the LAST 3 years
- 100% improvement in employee productivity
- 75% improvement in inventory turns
- 40% improvement in space productivity

Praise from the Expert

This summer in India I visited a remarkable air brakes plant belonging to the TVS Group that is one of the leanest operations I have ever seen outside of Toyota

- Mr Jim Womack

President and Founder
Lean Enterprise Institute

April 2002

To summarise

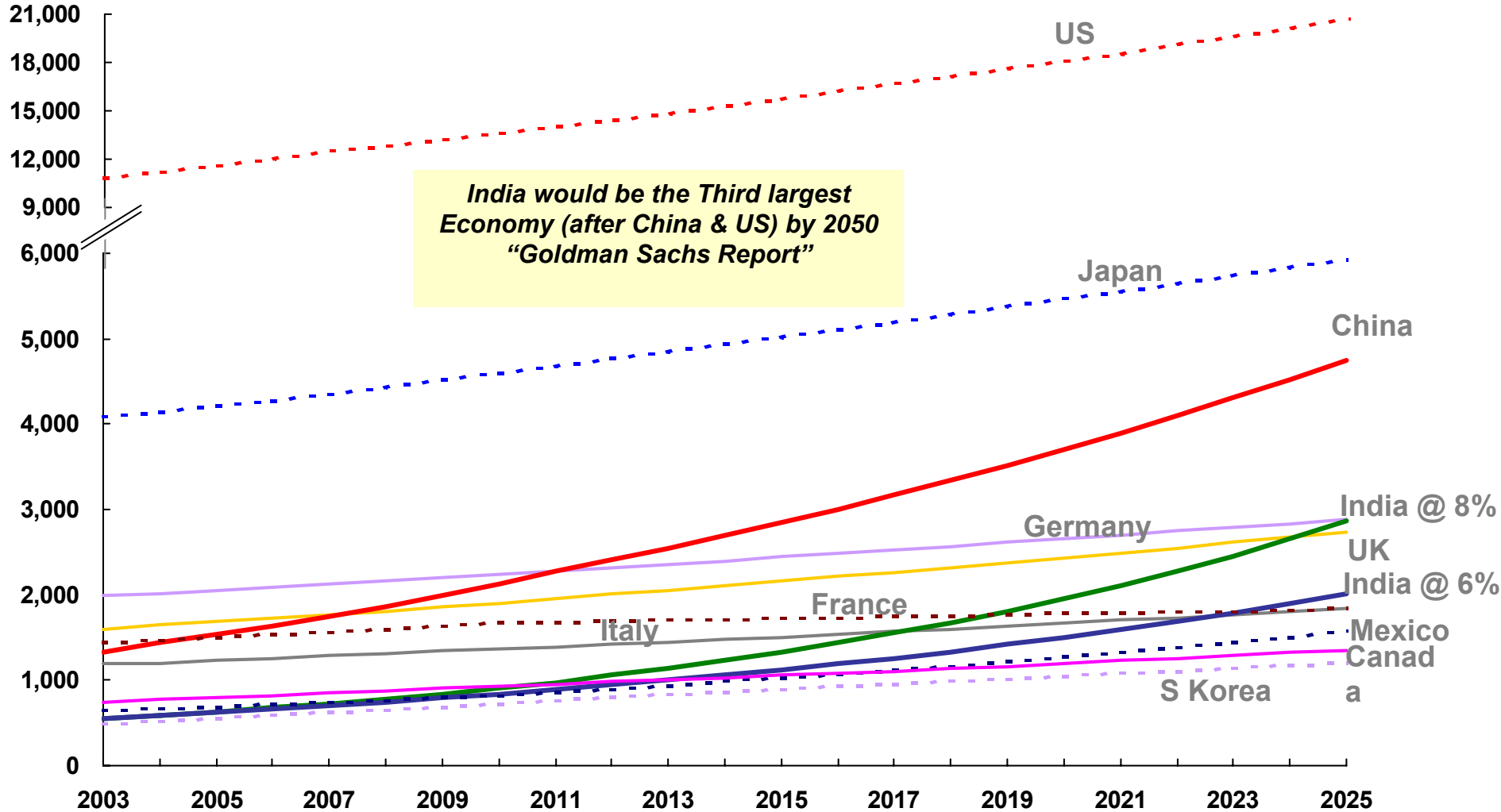
- Lean Manufacturing is a broad system strategy, but successful implementation is in the details.
- Lean Manufacturing is an Organization-wide Change process.
- Successful Implementation requires commitment & involvement across all levels.
- Lean solutions are usually no cost / low cost.
- “World Class” companies are implementing the Principles of Lean Manufacturing.

Advantage India

Has the potential to become one of the top 5 economies by 2025

USD billions

Real GDP *



India would be the Third largest Economy (after China & US) by 2050 "Goldman Sachs Report"

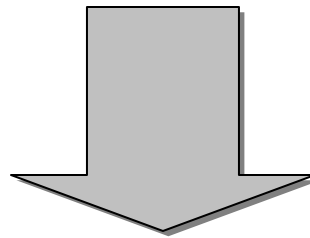
Source: ACMA

Opportunity for India

- Largest diamond cutting and polishing centre
- Largest producer of milk, tea and pulses
- Largest livestock population for food processing
- 2nd largest two wheeler manufacturers
- 2nd largest jewelry market
- 2nd largest in cotton textile trade
- 3rd largest leather producer after China and Italy
- Weak in Manufacturing

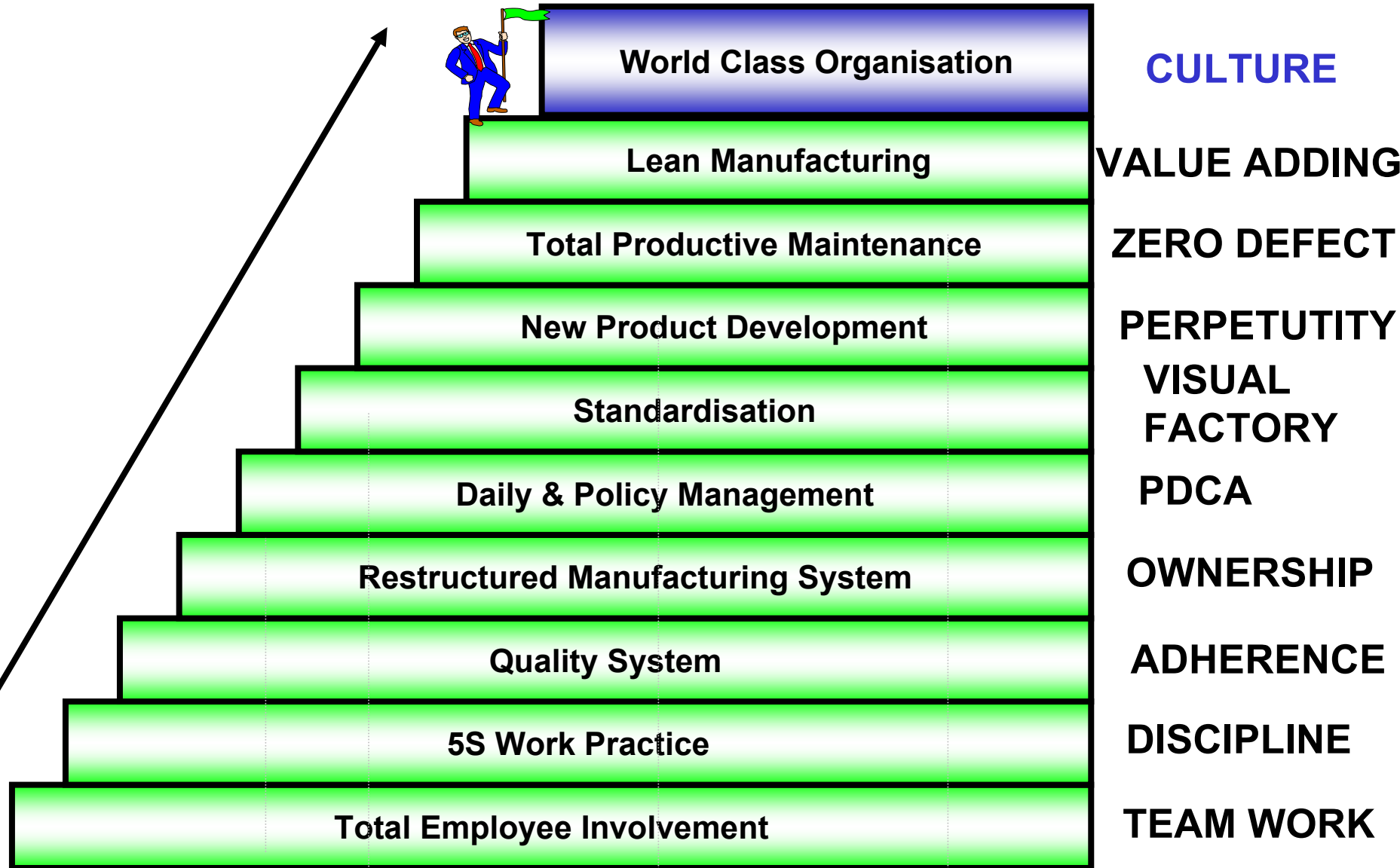
Miles to go....

- India needs a Manufacturing Revolution
- Currently (largely) limited to Auto industry
- But this represents only 10% of Indian mfg.



- Revolution needs to now spread to others- textiles, machinery, durables, electronics, electricals.....

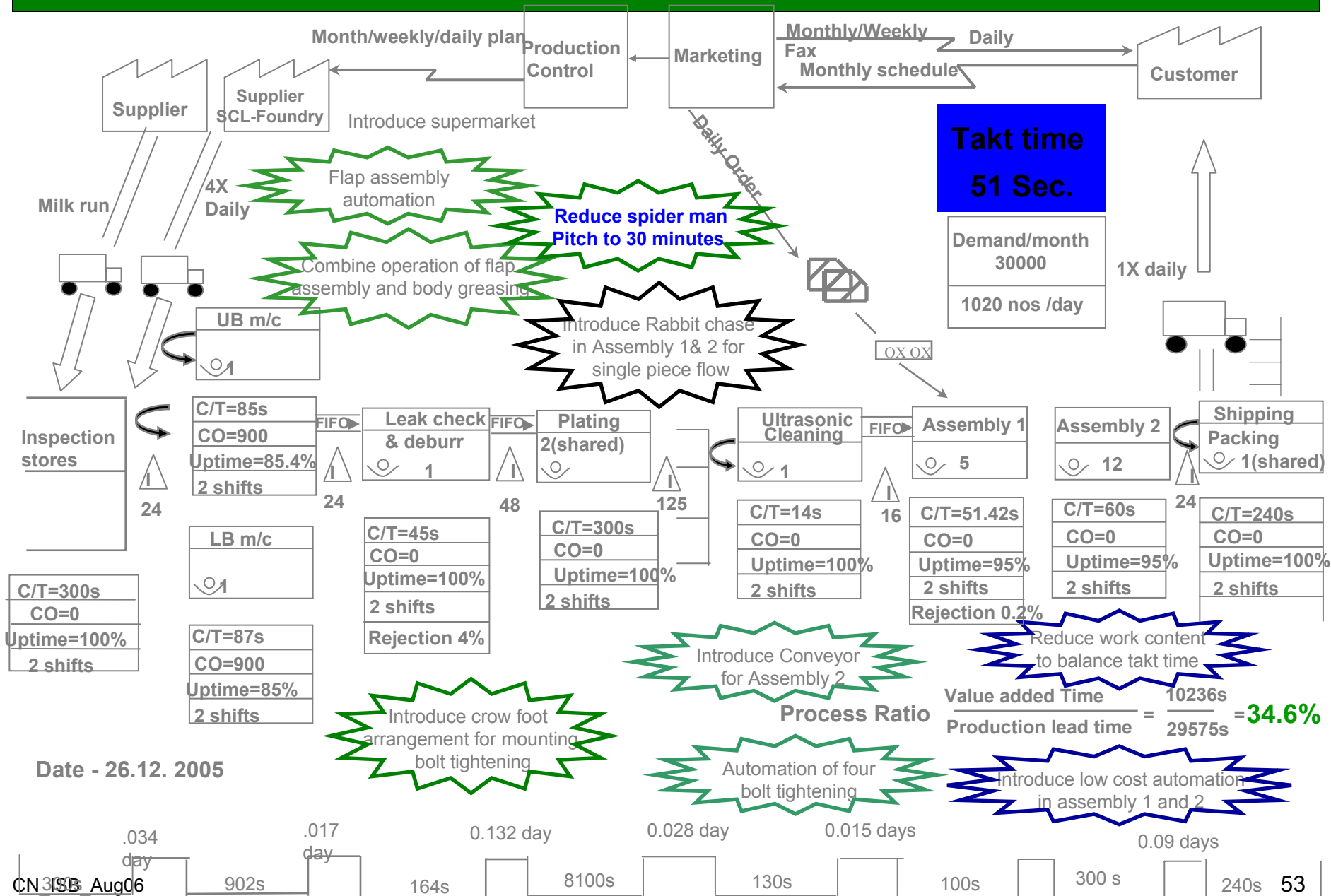
Roadmap for World Class Organisation



12 Steps to Lean Implementation

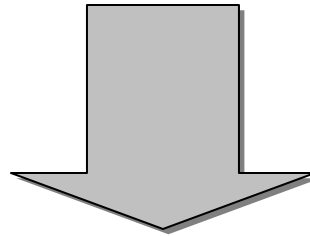
| STEPS | MEASURES |
|--|--|
| Step 1 : Value stream mapping <i>Mapping the process flow for a product / product family</i> | Process ratio in percentage |
| Step 2 : Balance to takt time <i>Match the pace of production to the pace of sales</i> | Ratio between cell bottleneck time and takt time |
| Step 3 : Single piece flow <i>Layout changes</i> | 1 WIP at each stage |
| Step 4 : Spider man system | Pitch 2 hours |
| Step 5 : Process stability Quantity <i>Loss elimination through TPM</i> | Variation +/- 5% |
| Step 6 : Process stability Quality | Variation +/- 5% |
| Step 7 : Pull system <i>Paced withdrawal</i> | Percentage of missed cards per shift |
| Step 8 : SMED | 1 Takt |
| Step 9 : Poka yoke | Rejection |
| Step 10 : Operator ownership | Step 3 status |
| Step 11 : Production levelling | Every part every shipping window |
| Step 12 : SOP | QP process (QP1, QP2 and QP3) |

Value Stream Mapping



Miles to go....

- For too long, we have seen our national advantage through the lens of wage cost only....



- Time to exploit others
 - Technology & Processes
 - Human competence
 - Innovativeness

Time to build on our strengths !!

**“It isn’t enough to be going fast in the right direction.
If you’re not going fast enough, you can still get run over.”**



Thank you