



# Growth partnership for a self-care-centric lifestyle

Innovation | Acceleration | Growth



**HCL smart manufacturing services  
and credentials**

# HCL's digital mfg./Industry 4.0 offerings and solutions

## Valuation drivers

Economies of scale | Business model innovation

## Growth drivers

Customer experience | New revenue streams

## Efficiency drivers

Operations excellence | production agility

## MAKING Digital WORK ACROSS THE ENTERPRISE BUSINESS LIFECYCLE

CONNECTED  
DESIGN



CONNECTED  
FACTORY



CONNECTED  
PRODUCTS & SERVICES



CONNECTED | INTELLIGENT | SECURE | INTEROPERABLE | AGILE

Technologies

- IT-OT INTEGRATION
- MFG AUTOMATION
- ADDITIVE MFG
- BLOCKCHAIN
- AR/VR/MR
- AI/ML
- ANALYTICS
- CYBERSECURITY
- ROBOTICS
- CLOUD

Service areas

- PLM
- EMBEDDED
- APPs
- INFRASTRUCTURE
- MES/ MOM
- IIoT
- DIGITAL ENGG
- BUSINESS
- PROCESS

Solution accelerators

- ROST
- ECCO
- PANGEA
- DFMPPro
- ENVISOR
- DDX
- PAS
- DDX

Partnerships

- ISV's
- INDUSTRY
- CONSORTIUMS
- ACADEMIA
- STARTUPS



# Smart manufacturing engineering services landscape at HCL

## Extensive capacity and capability

1000+ smart manufacturing professionals across the globe

9 years average FTE experience in ME services

Presence in  
USA, Germany, France, UK,  
Sweden, China, India, Indonesia,  
Korea

Three decades of experience in  
manufacturing engineering services

Global partnerships: Siemens,  
Dassault, Tecnomatix, Creo, PTC,  
critical manufacturing

Certified resources in MTM,  
MODAPTS, NIOSH, Six Sigma

## Driving efficiencies and value-added cost savings

\$30mn value saving through  
various manufacturing services  
and our own IPs till date

Over 50 plants were digitally set up  
and optimized by discrete event  
simulation

\$2M SAVED by successful design, validation and setup of high-  
density racks for inbound logistics in manufacturing plants

60-70% time reduction in CNC  
tool path programming

Savings of \$ 1.5 million per year,  
by reduction of line-side inventory

50% productivity improvement  
by minimizing the overall operating cost by redesigning the workstation and overall  
layout



## Cross-industry experience



Serving top 5 OEMs and 7 out of top 10 Tier 1s for over a decade



Serving top 3 off-highway equipment manufacturers for a decade



A decade long engagement with world leaders in medical devices



Serving world leader in consumer appliances



Serving top 5 industrial equipment manufactures



Serving world leader in office automation



Serving top 5 automotive OEMs for last 3 decades

## Ready to use solution accelerators and frameworks

CAD integrated design for manufacturing software that helps designers deliver high quality designs with minimal rework

Next-generation best in class CNC programming solution

Automatic nesting software for optimizing material utilization of larger 2D sheets

**Real-time manufacturing insights**  
Enabling real-time operational visibility from shop floor to top floor

# HCL's understanding of a smart factory systems landscape



### Manufacturing execution

- Operations Management
- Batch and Inventory management
- Product tracking and Genealogy
- Manufacturing Analytics

### Asset management

- Asset Information Management & Analytics
- Predictive Monitoring and Remote Management

### Plant to business integration

- Visibility to influence production and cost management
- Enterprise / business system information and integration

### Manufacturing intelligence

- Measure and manage Overall Equipment Effectiveness (OEE)
- Production reporting
- Alerts, process analysis, traceability and genealogy

Consulting

Design

Implementation

Application support

### Technologies and standards

- ISA 88, 95/ B2MML
- PDX, PLM XML
- EDI, Rosetta Net
- BPEL/SOA
- SECS, GEM
- EDA, EPT, 300mm
- OPC, OPC UA
- OAGIS, Modbus

### CONTROLLERS/ SCADA / HMI

- Control System Architecture Migration
- PLC/ RTU/CNC/DCS Engineering
- SCADA/HMI Development

### Remote plant monitoring

- Advanced process control and optimization
- Support and Maintenance

# Reference list of HCL's factory of the future solutions

- AR/VR based remote guidance and maintenance
- Live social distance monitoring
- Manufacturing analytics
- Digital assistant in field service
- Managing mobile assets and material handling
- Monitoring and maintenance of legacy equipment
- eZMfg: Plant monitoring dashboards
- WIP tracking
- Integrated engineering and manufacturing
- Plant data acquisition framework
- Smart pick/pack and bins
- Advance data-driven demand management
- Track and trace (T&T) of sub-assemblies and parts
- Real-time supply chain tracking
- Unified BOM management
- Model-based enterprise
- Design for additive manufacturing
- Digital thread and digital twin
- RFID based solution for finished good error proofing
- Image analytics for assembly quality
- Automated guided vehicles for assembly material movement
- Production analytics using microsoft azure
- Cobots and robots
- Plant simulation

- IOT & Data analytics
- Smart manufacturing
- Connected design



# HCL services in manufacturing engineering life cycle



Mfg Review  
for Design  
Phase



Process  
Planning



Make or buy



Plant System  
Engg



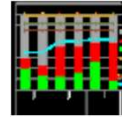
3D Plant



Proto  
Build



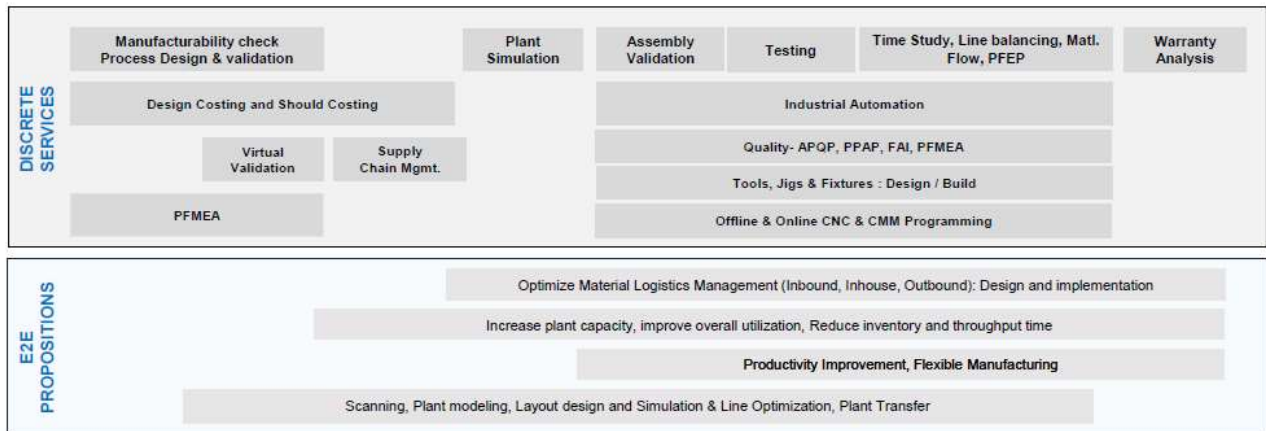
Pre  
production



Production  
Engg.



Aftersales  
Support



## Success stories



### Business challenge

- High volume lens manufacturing plant
- Manufacturing platform should be able to manage machine downtimes and productivity

### HCL i40 approach

- HCL built OEE and predictive maintenance solution based on Rockwell automation systems, Tableau, and Telit IoT platform. The second phase implemented analytics and trend/KPI dashboards

### Value delivered (impact on efficiency)

- Productivity improvement and real-time visibility and decision support for machine operations



### Business challenge

- The client had limited visibility into the manufacturing process at different stages with no alert and notifications to operators and the limited real-time KPI monitoring

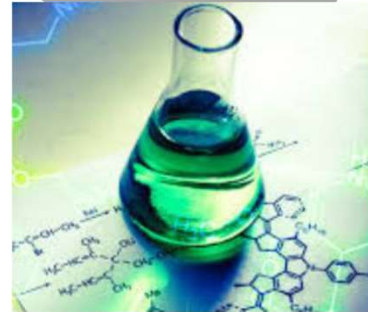
### HCL i40 approach

- HCL implemented SAP MII instance covering multiple plants
- Ensured connectivity to plant systems (PI, batch engines) and business systems
- Gained real-time feedback and analytics across manufacturing functions

### Value delivered (impact on efficiency)

- Real-time decision support resulted in timely rectification of problems
- Faster RCA was achieved through deeper analysis of KPIs

Manufacturing operations visibility for a chemical plant



Smart factory initiative for a consumer electronics major



### Business challenge

- Legacy shop floor systems with no connectivity was preventing real-time visibility into production as well as introducing standardization

### HCL i40 approach

- Deployment of MOM product across the plants including machine integration
- Manufacturing data lake ingesting data from the shop floor and business systems and building Power BI based dashboards for visibility
- Building AI/ML-based algorithms for improving manufacturing operations

### Value delivered (impact on efficiency)

- Standardization of systems and processes
- Real-time visibility at all levels



# Productivity improvement - Appliances manufacturer

## Scope

Static simulation using lean manufacturing principles, equipment analysis to provide the details like cost calculation, kitchen production capacity, equipment utilization, labour requirement and inventory.

Tools and applications used: Tecnomatix Plant Simulation, Microsoft Excel.

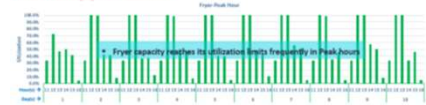
## Execution approach

- Development of plant simulation model with all the constraints and rules of the real-time production system
- Capacity validation of ASIS system an equipment utilization
- What if scenarios to evaluate possible solutions and the behavior of systems
- Development of Excel-based simulator for peak hour demand analysis, capacity validation, workload balancing, walk distance analysis, equipment utilization

Peak Hour Scenario Comparison



Peak Hour : Equipment Utilization



## Benefits

- Increase in on-time order delivery from 53% to 79% (by adding one fryer)
- Recommendations to eliminate 25% of NVA

# Real-time visibility for throughput improvement

## Scope

Improving throughput and validation of ROI for additional battery charging system for a North America battery manufacturing plant

Validate the throughput of the system and perform return on investment analysis with addition on new and exit line for the battery production system

Tools and technology used: Plant simulation, Auto CAD

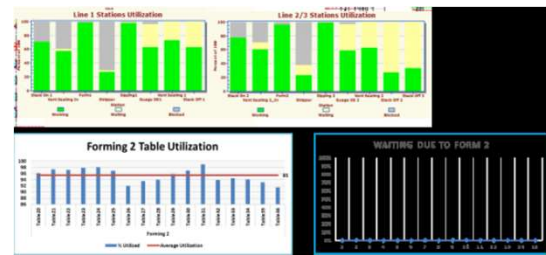
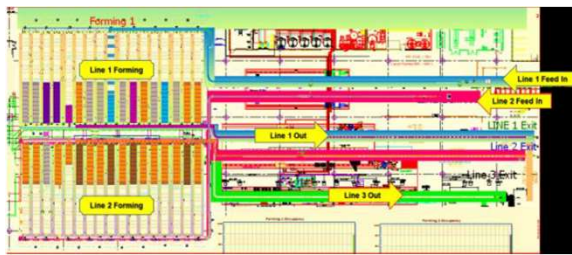
## Execution approach

- A comprehensive dynamic simulation modeling
- Capacity validation of ASIS system with future state
- Identification of bottlenecks in the system
- What if scenarios evaluate possible solutions and behavior of systems
- Result analysis and cost evaluation

## Benefits

- 35% productivity (from 17800/day to 24000/day) improvement by removing NVA activities
- Simulation analysis inferred extra charging line was not required, which saved \$300K infrastructure cost.





# Productivity improvement - Pump and gas meter OEM

## Scope

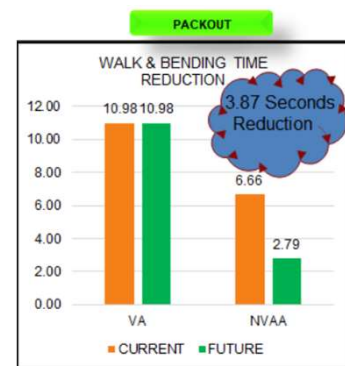
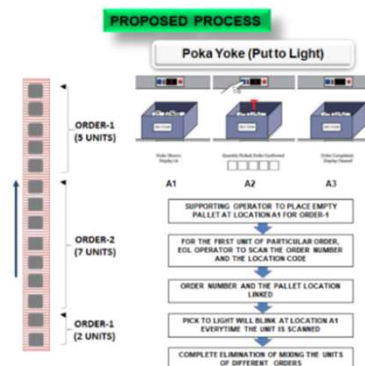
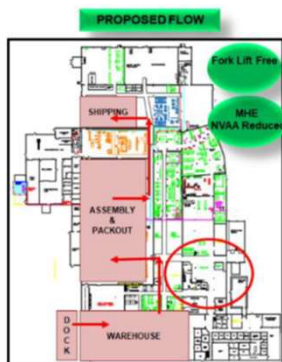
Optimizing the manufacturing and supply chain operations for gas meter manufacturer in North America using smart factory solutions.  
Tools and applications used: MTM UAS, AutoCAD, Microsoft Excel.

## Execution approach

5 Phase approach to study, analyse and optimize the assembly process, material feeding, plant layout, in plant logistics, packaging and inventory.

## Benefits

- 40% of the total number of high budget and high savings ideas have been approved by the customer for implementation, which resulted in potential savings of \$1.5 on each unit which equals \$1 Mn per annum.



# Standard time computation - HVAC OEM

## Scope

Standard time computation for fan deck assembly and frame assembly using MTM UAS analysis

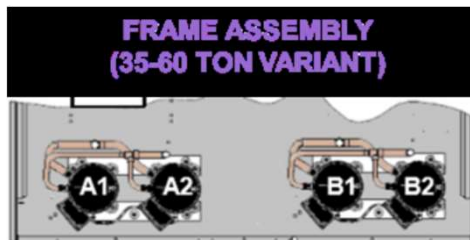
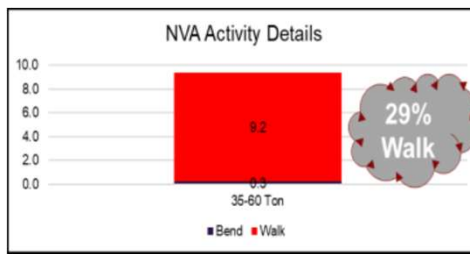
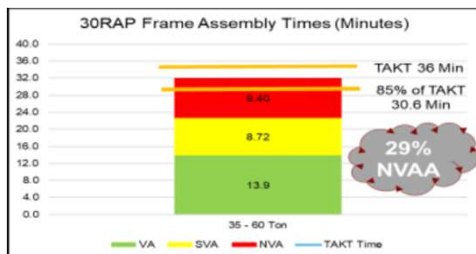
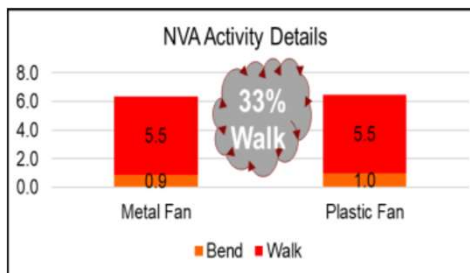
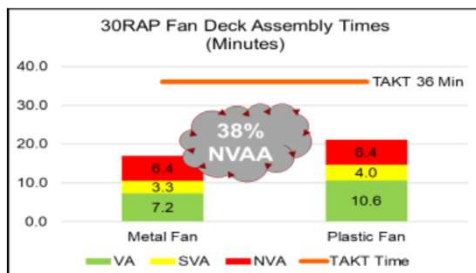
Tools and applications used: Microsoft Excel

## Execution approach

- Logical split up of the whole process into activities and each activity into elements
- Attach MTM UAS code to each element and compute the time
- VA NVAA analysis (value add and non-value add activities)

## Benefits

35% of NVA reduction in fan deck and frame assembly stations.



# Plant transfer and consolidation

## Scope

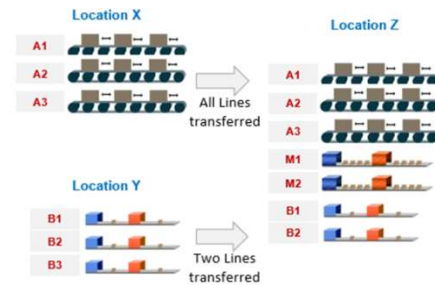
Consolidation of two plants into one plant within the USA for North American off-highway OEM  
Tools and applications used: FactoryCAD, Vismockup, Tecnomatix Plant Simulation, Creo, Proplanner

## Execution approach

- Target-defined data collection and validation
- Process design, material flow design, operating plan, installation plan, build plan
- Setup and validation, pilot production, hand over to the production

## Benefits

- 37% manpower reduction
- 25 value streams to 7, 15% safety improvement



# In-plant logistics for flexible production

## Scope

Improvement in the efficiency of car assembly line by improving line side inventory, buffer stock, MHE utilization for the Indian plant of a European CAR OEM

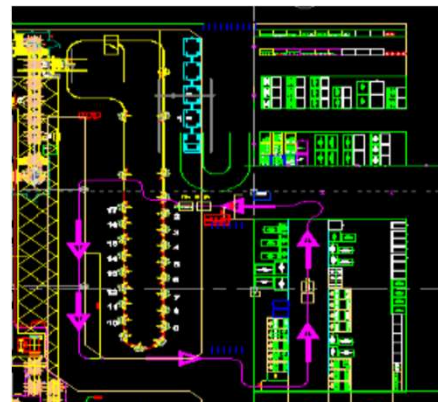
Tools and applications used: Autocad, Siemens Tecnomatix Plant Simulation

## Execution approach

- Creation of assembly flow model
- Identified bottlenecks in the system, which was the reason for stoppages
- Developed simulation model by using DES technique
- Checked multiple scenarios for inventory, MHE utilization and manpower utilization
- Optimized scheduling, reorder point and reorder quantity at each station's buffer
- Developed new route for MHE

## Benefits

- 20% optimization in line side inventory
- 15% optimization in MHE



# 3D plant layout

## Scope

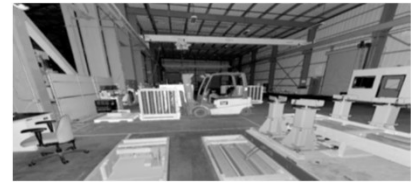
3D factory as is using point cloud for 300000 sq. ft Tools and applications used: FactoryCAD, Faro scan utility, Autodesk

## Execution approach

- Laser scanned the factory with LOD 300
- Developed the best method to know what to scan and what not
- Postprocessed point cloud data,
- Used FactoryCAD for building models
- Developed 3D models, 2D layouts and drawings

## Benefits

15% time saving by identifying similarities in non-standard objects



SCAN



3D LAYOUT

# Layout optimization

## Scope

Layout modification for optimization in line side inventory and space-saving

## Execution approach

- Studied facts and understood future plan and dependencies
- Identified components for kitting and sequencing to reduce the footprint of the material at the line side
- Minimized the non-value-added work and balanced the workload between the resources to eliminate wait time and WIP
- Optimized the material delivery routes to improve the utilization of the material handling resources and deliver the material using JIT concepts

## Benefits

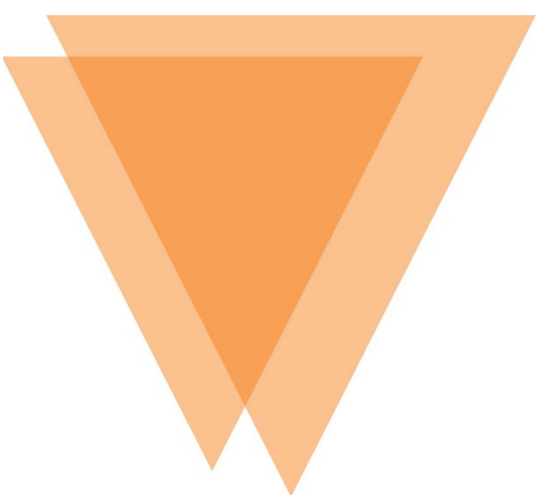
- 15% space saving
- 20% optimization in line side inventory



BEFORE



AFTER



FOR MORE INFORMATION, PLEASE CONTACT

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