

Digital Blueprint - “Bharat Forge” - Baramati Plant.

25 Aug 2023

Discussion paper – To create a footprint for digital transformation journey
Version 01

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Our Understanding of Your Needs & Proposed Scope



Bharat Forge Ltd., Baramati Plant plans to implement Digital Transformation Project to Improve productivity, quality and reduce down time & manpower using Advance Analytics and IIoT



Bharat Forge Automotive Problem Statement

1. Reduce our machine downtime - Minimize Die Failure Downtime by Implement predictive maintenance
2. Optimize Manpower Utilization - use automation/streamline operations to achieve manpower reduction.
3. Enhance Cost Efficiency - Utilize data-driven insights and automation to lower operational & Energy costs without compromising quality



Industry.AI Proposed Scope

1. Capture the available data from the PLC and SCADA System and deploy our **Predict.AI** ML/DL algos to predict failure in advance.
2. Propose additional sensors for vibration and electrical signal analysis to improve failure prediction.
3. Automation of repetitive tasks: Deploy our **Trust.AI** to automate systems to perform tasks that are currently done by humans.
4. Digitization of paperwork: This could help to reduce the amount of manual data entry, which is a time-consuming and error-prone process
5. Energy efficiency measures – Deploy our **Conserve.AI** to monitor quality of the power usage and reduce waste.



Industry.AI Deliverables

1. Digital Transformation Roadmap: Create a detailed roadmap outlining the stages of digital transformation, technologies to be integrated, and key milestones to achieve enhanced efficiency.
2. Sustainability Practices Implementation: Integrate sustainable practices into operations where feasible, contributing to environmental responsibility and potentially reducing long-term costs.
3. Knowledge Sharing Mechanisms: Set up knowledge-sharing mechanisms, including the deployment of tools like ChatGPT, to facilitate the exchange of expertise and insights within the organization.



Targeted Objectives

1. Advanced Downtime Prevention: Develop predictive maintenance strategies to proactively avoid downtime, particularly due to die failures.
2. Manpower Optimization: Implement technologies to reduce both white-collar and blue-collar manpower while maintaining operational effectiveness.
3. Cost Efficiency Enhancement: Leverage data analysis and automation to identify cost-saving opportunities without compromising quality or output.
4. Digital Transformation: Drive the plant's journey towards comprehensive digital transformation through strategic technology integration.

Objective

Listed below are the potential savings post implementation of the Predict.AI, Trust.AI and Conserve.AI application.

XX%

Reduction of
Downtime for Die
Failures

Benchmark
Annual Average (2021 &
2022)
i.e. XXXX Hours

XX% ~ Reduction Target
(XX Hours)

XX%

Reduction of Man-
power

Benchmark
White-collar = XX
Blue-collar = XX
Securities = XX

XX% ~ Reduction Target
(Number)

XX%

Cost Savings

Benchmark
Annual Average (2021 &
2022)
i.e. XXXX Kwh

XX% ~ Target to Save(in
Rs)

Note: all the estimates to be done on pro-rata basis. The start date should be the date of deployment of all the AI models and solutions. All required Historical Data to be shared by Client.

Projects - Summary

Project's identified and to be executed with business benefits.

P. No.	Project Name	Priority	Objective	Proposed Solution	Business Benefits
01	Prediction of Failures on Forging Machine	High	Predict failures in forging machines mainly on Die using data analytics and AI techniques.	Implement machine learning algorithms to analyze historical data and machine parameters for early failure prediction.	* Reduced downtime due to timely maintenance * Enhanced machine reliability * Optimized maintenance costs
02	Furnace Roll Length Management	Medium	Manage furnace roll length through suitable measurement solutions and data integration.	Deploy accurate length measurement sensors integrated with data systems to ensure precise furnace roll length tracking.	* Improved accuracy in furnace roll length tracking * Enhanced quality control * Streamlined production process
03	Descaling Pressure Monitoring	Medium	Automate descaling pressure monitoring for consistent operations.	Install automated pressure sensors connected to the SCADA system for continuous monitoring and instant alerts.	* Consistent product quality * Reduced downtime due to timely interventions * Enhanced process efficiency
04	Trimming Machine - Temperature Monitoring & Dimension	Low	Monitor trimming machine temperatures, correlate with final dimensions for process control.	Implement temperature sensors and develop algorithms to correlate temperature data with final product dimensions.	* Improved final product consistency * Reduced rework and scrap * Enhanced process control
05	BHN Hardness Reading Data Integration	Medium	Integrate BHN hardness readings with SCADA dashboard for real-time quality tracking.	Integrate hardness measurement devices with the SCADA dashboard to display real-time hardness readings and trends.	* Real time quality visibility * Efficient quality control adjustments * Enhanced product quality

Projects - Summary

Project's identified and to be executed with business benefits.

P. No.	Project Name	Priority	Objective	Proposed Solution	Business Benefits
06	End-of-Line Quality Inspection	High	Implement automated inspections for dimensions and surface defects, integrated in SCADA/SAP.	Integrate vision systems and automated measuring devices at the end of the line to inspect dimensions and surface defects.	* Improved product quality and consistency * Real time defect detection * Enhanced data driven decision making
07	Pick and place automation	High	Automate material handling and placement tasks with robotic systems.	Design and implement robotic pick and place system. Integrate with existing production line. Program for accurate object detection and placement. Conduct cost-benefit analysis for ROI estimation.	* Enhanced production throughput * Improved accuracy and consistency in object placement * Reduced manual labor and associated costs
08	Facial Recognition	Low	Explore facial recognition technology for specific use cases.	Conduct feasibility study and discussions to define use cases, considering access control, attendance tracking, and security applications.	* Enhanced security and access control * Streamlined attendance tracking * Potential for innovation integration
09	Manual Data Entry in SAP Conversion	Low	Convert manual SAP data entry into automated workflows.	Identify SAP processes for automation, and implement data integration tools and workflows to automate data entry.	* Reduced human errors * Streamlined processes * Enhanced data accuracy and integrity
10	Yard Management - Finished Goods	Medium	Improve yard management for quick part retrieval and loading.	Implement an RFID-based inventory tracking system and digital mapping of storage locations for efficient yard management.	* Reduced loading delays * Efficient part storage and tracking * Streamlined shipment preparation

Projects - Summary

Project's identified and to be executed with business benefits.

P. No.	Project Name	Priority	Objective	Proposed Solution	Business Benefits
11	Pallet Monitoring - In Plant and Customer Location	Medium	Implement pallet monitoring within the plant and at customer locations for efficient shipment preparation.	Deploy IoT-enabled pallet tracking devices integrated with a central system for real-time visibility of pallet location.	* Minimized shipment delays * Efficient pallet utilization * Enhanced supply chain visibility
12	Machine Connectivity Enhancement (OEE)	Medium	Overcome protocol and communication challenges for machine integration.	Develop protocol converters, gateways, or alternative communication methods to ensure seamless integration of machines into the digital ecosystem.	* Enhanced data collection and analysis * Improved machine connectivity * Streamlined operations
13	Setup LLM (ChatGPT) in Server Environment	Low	Implement a Language Model (LLM) for creating a knowledge base and sharing expertise.	Deploy a server-based LLM solution with training data, enabling automated responses for knowledge sharing and collaboration.	* Efficient knowledge management * Improved collaboration * Enhanced decision making and problem solving
14	Security Manpower Reduction Using Drone Vision Monitoring	High	Reduce security manpower with drone-based vision monitoring.	Deploy drones equipped with cameras and AI for perimeter monitoring, integrating with security systems for real-time alerts.	* Reduced security personnel costs * Enhanced surveillance coverage * Efficient security monitoring
15	Gate Pass Digitization	Low	Digitize gate pass processes to reduce manual paperwork and manpower.	Implement an automated gate pass system with barcode or RFID technology for streamlined entry and exit procedures.	* Streamlined entry and exit procedures * Reduced administrative workload * Improved security and access control
16	Energy Management Using Existing Data	High	Optimize energy management based on historical data.	Analyze historical energy consumption patterns and implement energy-saving initiatives based on data insights.	* Reduced energy consumption and costs * Enhanced sustainability * Optimized resource utilization

Projects that will drive transformational value (\$\$\$)



Project's identified by BLP Industry.AI and to be executed with business benefits.

Transformational areas

P. No 1,2,3 Predict Failure in Advance

Prediction projects focus on leveraging data analytics and advanced technologies to predict potential issues and failures, allowing proactive actions to be taken before problems arise..

P. No 7,9,10,11,13,13,14,15 Optimize Manpower Utilization

Focus on automating manual processes and tasks within the operational workflow. Aims to enhance efficiency, reduce human errors, and optimize resource utilization.

P. No 16 Enhance Cost Efficiency

Optimizing energy consumption and resource utilization within the plant's operations. Analyzing historical energy consumption patterns, identifying areas of inefficiency, and implementing initiatives to reduce energy usage without compromising productivity

Metrics-that-matter

- # of breakdowns
- Hours lost due to breakdown
- Component/ output loss due to breakdown

- # of rework and scrap
- # of safety and security instances
- Retaining knowledgeable resources
- # and type xls sheet for same work

- Unit consumption per part
- Quality of energy
- Maintenance impact on energy

Impact on: Revenue Cost Savings Customer Experience

Revenue	Cost	CX

Revenue	Cost	CX

Revenue	Cost	CX

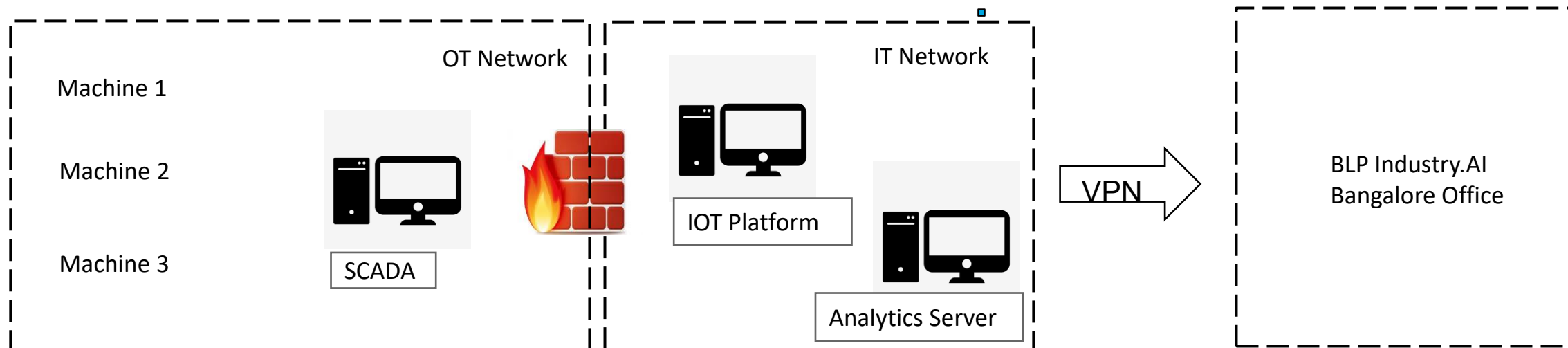
High value projects, budget and business value

Project's identified and to be executed with business benefits. (* considered for budget/approx)

P. No.	Project Name	* Machines	* High level BOM	* High level Budget (in CR)	*Potential ROI
01	Prediction of Failures on Forging Machine	30	<ul style="list-style-type: none"> - Advance Analytics - Vibration sensor (if required) - Electrical sensors(if required) 	₹ 0.4 to 2.5	High (20% - 50% reduction in downtime costs, improved productivity)
02	Furnace Roll Length Management	5	<ul style="list-style-type: none"> - Camera - GPU 	₹ 0.3 to 0.6	Medium (10% - 20% reduction in rework costs, improved accuracy)
11	Pallet Monitoring - In Plant and Customer Location	500	<ul style="list-style-type: none"> - Tags (400 deg.c) - Or Camera 	₹ 0.6 to 0.9	Medium (Reduced delays, optimized pallet usage)
12	Machine Connectivity Enhancement (OEE)	800	<ul style="list-style-type: none"> - Gateways - Protocol Drivers - IT service 	₹ 1.2 to 4.5	Medium (Improved data collection, streamlined operations)
13	Setup LLM (ChatGPT) in your Server Environment	2 servers	<ul style="list-style-type: none"> - GPU Servers - IT service 	₹ 0.4 to 0.8	Low-Medium (Enhanced knowledge sharing, collaboration)
16	Energy Management Using Existing Data	200+	<ul style="list-style-type: none"> - Advance analytics - IT service - Energy Audit 	₹ 0.3 to 0.5	High (Reduced energy costs, enhanced sustainability)

Proposed Solution setup to start the projects

Connect 80+ Industrial AI/ML/DL algorithms into IoT data to find insights



Analytics Server Specification :

- 8 core with 32 GB machine
- Windows OS
- Required permission to create VPN for remote access

What we need from you to start?

Listed below are the requirement to start the project

- Server to deploy our advance analytics models
- Machine details, Tag detail, production detail, SAP access

Data Required – Project 01

Prediction of Failures on Forging Machine

1. Historical data for at least past 12 months, relevant to each problem of Forging Machine?
2. Failure history of Die for the past 12 months?
3. What is the type of die, the material of the die, and the life of the die?
4. What is the min and max cycle count of Die before failure?
5. Availability of the process and machine parameters data like Temperature, Flow Rate, Tonnage, and Pressure tags? . Send us of machine and related parameter.
6. What are the forging speed and the alignment conditions?
7. What are the types of cooling and lubrication systems involved?
8. Availability of Maintenance report and Inspection report?
9. What are the manual operations involved?
10. What are the approaches/technologies tried till now to reduce the downtime related to forging machine?

Data Required – Project 02

Furnace Roll Length Management

1. What are the challenges or issues you currently face in managing furnace roll lengths?
2. Are there specific quality standards or regulations that your roll lengths must adhere to?
3. Do you have any existing methods or systems for measuring roll lengths? If yes, how effective are they?
4. What is the desired accuracy level for roll length measurements?
5. Have you identified any specific Key Performance Indicators (KPIs) that you want to improve through this project?
6. How many minutes/seconds it halts in a location to capture image?
7. Do you want to give feedback to your PLC or OT system if we find any exceptions?

Data Required – Project 11

Pallet Monitoring - In Plant and Customer Locations

1. Can you provide an overview of your current pallet management process and the challenges you face in tracking pallets?
2. What is the main objective you aim to achieve through improved pallet monitoring both within your plant and at customer locations?
3. Do you currently use any form of tracking or identification for your pallets? If yes, how effective is it?
4. How do pallets move within your plant and during transit to customer locations?
5. Are there specific requirements for tracking pallets within your plant (e.g., specific areas, entry/exit points)?
6. Are there specific environmental conditions (e.g., temperature, humidity) that the tracking system needs to withstand?
7. Are there specific environmental conditions (e.g., temperature, humidity) that the tracking system needs to withstand?
8. Type of pallets and picture
9. Plant layout

Data Required – Project 12

Machine Connectivity Enhancement (OEE)



Microsoft Excel
Worksheet

industry. 

1. PLC / DCS / SCADA details – PFA a template to get these details
2. Tag list or data access to find tags
3. Which machines or production lines are the highest priority for connectivity and OEE improvement?
4. Do you have any preferences for the type of gateway devices or driver software in data collection to be used on the machines?
5. How will the data from the machines be stored and managed? Do you have an existing database or system for this purpose?
6. Have you identified any specific Key Performance Indicators (KPIs) that you want to improve through this project?
7. Are there any concerns or challenges you foresee in implementing machine connectivity and OEE improvement?
8. How do you plan to measure the success and ROI of this project once implemented?

Data Required – Project 13

Setup LLM (ChatGPT) in Server Environment

1. Can you provide an overview of your current knowledge sharing processes and challenges within the organization?
2. Do you have any specific integration requirements with existing software, platforms, or communication tools?
3. Are there any privacy or security considerations when it comes to using a language model for internal knowledge sharing?
4. Do you have specific expectations for response time or performance of the language model?
5. Are there any concerns or challenges you foresee in implementing the language model in your server environment?
6. What is your budget range for setting up and maintaining the language model in a server environment?

Data Required – Project 16

Energy Management Using Existing Data



1. High Energy Consumption equipment list with Ratings
2. Last 12 Months' energy consumption data (Area or Machine wise)
3. Last year's SEC (Specific energy consumption) data with Machine or Area or Plant
4. List of pain points associated with energy monitoring, losses and wastages
5. Plant SLD

Next Step

Our focus on delivering value



1. Prioritize the projects based on potential impact, alignment with the plant team's goals, and feasibility of implementation.
2. For the top-priority projects, we will prepare a detailed proposal that outlines the project scope, objectives, proposed solutions, expected outcomes, budget estimates, and timeline.
3. Need more detail to conduct a cost-benefit analysis for each project to estimate the potential return on investment (ROI)
4. Session with your team to present this pitch and address any questions or concerns. Create a core team who can focus on this initiative.

Thank You

Contact: Rahul/Gokul

M: +91 7757800948

M: +91 9611143784

Email: blp@blp.co.in

Video : <https://www.youtube.com/watch?v=ZdSYaWYo0pM>
[ai.com/](https://industry-ai.com/); <https://industry-ai.com/covid-19/>

Website: www.blp.co.in; <https://industry-ai.com/>