How Manufacturing leaders are leveraging AI

**01 Demand Planning & Forecasting**
- Predict future demand with greater accuracy, leading to optimized production and reduced costs.
- SmartOpt, a Chemical manufacturing company saw that forecasting accuracies for the next 6 months reached 85-99% with AI models.

**02 Product Development**
- Accelerate design processes, generate innovative concepts, and enhance product quality.
- Airbus leveraged AI-enabled generative design techniques to create a bulkhead that was 40% lighter, yet 50% stronger, than prior versions of the Airbus A320 aircraft.

**03 Production scheduling and planning**
- Optimize production schedules, minimize downtime, and ensure efficient resource allocation.
- Boeing uses AI algorithms to analyze machine availability, material lead times, and production capacity to create optimized production schedules.

**04 Predictive Maintenance**
- Prevent equipment failure, reduce maintenance costs, and improve production uptime.
- Using sensors, data analytics, and machine learning, ABB predicts turbine failures with 95% accuracy and offers remaining life insights based on operating conditions.

**05 Quality control & visual inspection**
- Automate defect detection, enhance accuracy & consistency & streamline quality control process.
- Mitsubishi Electric has developed behavioral-analysis AI that analyzes manual tasks without requiring training data.

**06 Inventory Management**
- Manage inventory levels, minimize stockouts and overstocking, & improve overall inventory management efficiency.
- Danone Group has seen a 30% reduction in lost sales & a 30% reduction in product obsolescence with the right inventory analytics.

**07 Warehouse & Logistics management**
- Streamline warehouse operations, optimize logistics routes, and increase efficiency and accuracy.
- Amazon is leveraging AI to speed up deliveries with transportation & logistics, such as mapping and planning routes & where to place inventory.

**08 Sustainability & Environmental Impact**
- Identify areas for resource optimization, waste reduction, and promote sustainable practices.
- Apollo Tyres is working on ways where AI can help reduce the amount of scrap materials produced in manufacturing.
Most implemented use cases by sector

Let's take a look at the most prominent use cases in each of the manufacturing sectors and the types of AI techniques and programming used out of Symbolic AI, Rules Based, Robotics, Computer Sensing, Knowledge Engineering, Natural Language Processing, and of course, Machine Learning.

Automotive

Top 5 current analytics & AI use cases in the automotive sector include:

01 Predictive Maintenance
02 Product Development
03 Generative Design
04 Collaborative Robotics
05 Quality control & visual inspection

Consumer Goods

Top 5 current analytics & AI use cases in the manufacturing of consumer goods include:

01 Demand Forecasting
02 Inventory Management
03 Quality inspection
04 Supply chain visibility
05 New product design & enhancement

The overall impact of AI and analytics on Manufacturing business operations*

<table>
<thead>
<tr>
<th>Impact</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in unplanned downtime</td>
<td>Upto 50%</td>
</tr>
<tr>
<td>Reduction in excess inventory</td>
<td>20-30%</td>
</tr>
<tr>
<td>Reduction in product defects</td>
<td>10-20%</td>
</tr>
<tr>
<td>Gain in productivity with smart factories</td>
<td>17-20%</td>
</tr>
<tr>
<td>Reduction in forecasting errors with AI</td>
<td>20-50%</td>
</tr>
</tbody>
</table>

*Multiple sources

Using data and AI for end-to-end operations

AI & analytics can help improve the operations from a single asset to the value chain.
According to a report by Bain, regardless of their affinity for digital technology, manufacturing executives ranked AI (including GenAI) first among technologies that could positively disrupt their operations. This shows the potential data and AI have to boost productivity, reduce scrap, and improve quality. Let’s take a look at the barriers that’s preventing them from the adoption and a few KPIs you can start with.

### Industrial manufacturing

Top 5 current analytics & AI use cases in industrial manufacturing include:

1. **Intelligent Maintenance**
2. **Real-time optimization**
3. **Collaborative robotics**
4. **Energy management**
5. **Quality control & visual inspection**

### Pharmaceutical

Top 5 current analytics & AI use cases in the manufacturing of pharmaceutical products:

1. **Process optimization**
2. **Regulatory compliance**
3. **Predictive maintenance**
4. **Inventory management**
5. **Quality Control & Process Optimization**

### What’s stopping the leaders: Key barriers to AI

From a mismatch between AI capabilities and operational needs to lack of explainable models there are quite a few challenges leaders are facing. Additionally, for evaluating generative AI models, the three main areas to focus on are: model quality, system quality, and business impact.

### KPIs you should track in your manufacturing AI journey

- Defect detection rate
- OEE (obviously)
- Cycle time reduction
- First pass yield
- ROI on predictive maintenance
How to approach AI for Manufacturing

Though generative AI has sped up the process of AI adoption, artificial intelligence is still a big step for any organization. You need to take the next step based on a feasibility assessment comparing it to the business impact. Here is a sample journey towards autonomous operations from a descriptive start.

The human dynamic

Involve the workforce

Alerts & Visualization
- Provide users with contextualized data, to act quicker and smarter
- Use case driven- solve for key problems or opportunities
- Create a foundational digital platform that will evolve with the business

Digitalize Knowledge
- Extract & formalize “tribal knowledge” as structured data
- Start developing a knowledge graph with structured and unstructured data
- Develop platform and governance to scale

Learn from the workforce

Integrate the workforce
- Enrich contextualized data with tailored insights (descriptive/predictive analytics)
- Run total system optimization (human + machine)
- Governance and platform integrated with operating procedures

Embed Insights
- System recommends appropriate and optimal action (prescriptive analytics), combining human + machine response
- System continues to learn and evolve
- Structured workforce/data science governance to develop use cases and insights

Cognitive Factory
- Self-learning, autonomous closed loop systems designed to sense, comprehend, act and learn, human behavior
- Operators’ role and skills evolving to focus on complex activities and system evolution

Autonomous operations

Transformational

Business Impact

Tactical

Digital twin journey

How Polestar can help you achieve this

The human dynamic

Start with specific use cases and scale to other markets to build capabilities to generate value

Extend use case driven capabilities to help develop fully mature capabilities

Roll out capabilities to all markets & products to help achieve future state vision

Future-State Vision

www.polestarllp.com

© 2024 Polestar Solutions India Pvt. Ltd. All rights reserved. For more information, email marketing@polestarllp.com