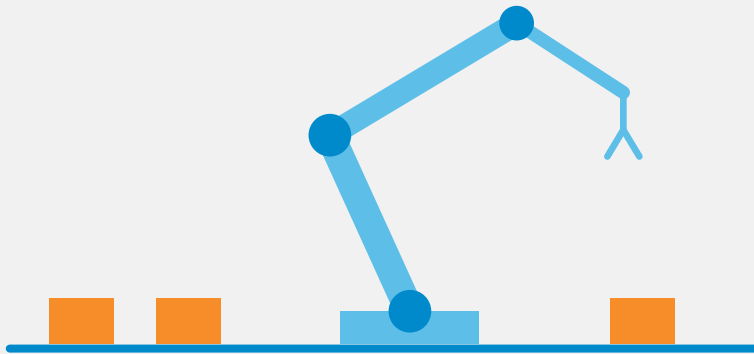




PRECISION AT PRODUCTION SPEED

An Automation Playbook for Automotive Manufacturing

Eight shop-floor challenges, eight practical solution paths: from robotic assembly and AI inspection to smart OEE, flexible lines, retrofits, testing, safety and energy.

INSIDE THIS PAPER

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Robotic Assembly

Beat line bottlenecks

2

AI Vision Inspection

Catch every defect

3

Welding Automation

Repeatable weld quality

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Smart OEE Monitoring

See losses live

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Flexible Changeovers

Mixed-model ready

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Zero-Downtime Retrofit

Upgrade without stopping

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EOL Test Automation

Every part on record

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Safety and Energy

Safer, leaner plants

WHY THIS PAPER

Automation that fits the way automotive plants really run

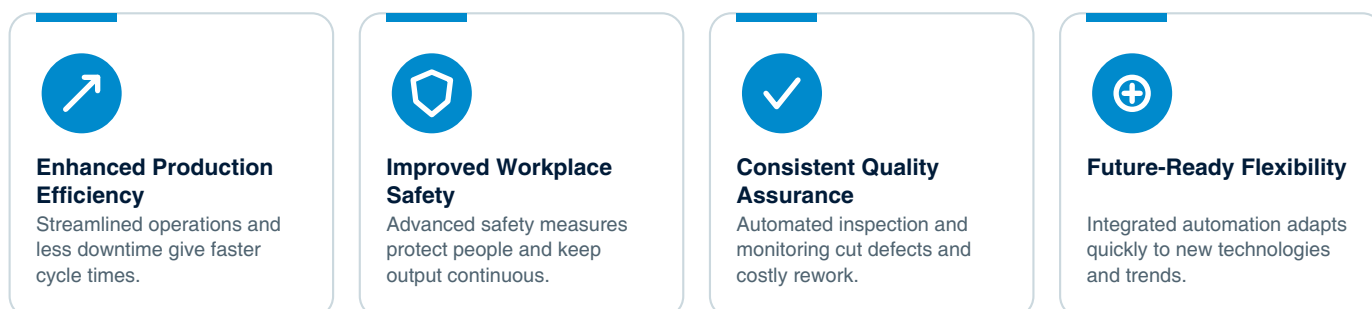
Automotive and heavy-manufacturing plants juggle complex assembly lines, production bottlenecks and human error. Manual assembly creates variability in fitment, raises defect rates and limits throughput, while safety, compliance and skilled-labour gaps add pressure. This paper follows one line from first assembly to final energy bill and shows eight places where practical, integration-friendly automation removes the pain, with a self-assessment and roadmap to help you start.

Bottlenecks, quality drift and skilled-labour gaps are pressures every automotive plant recognises.

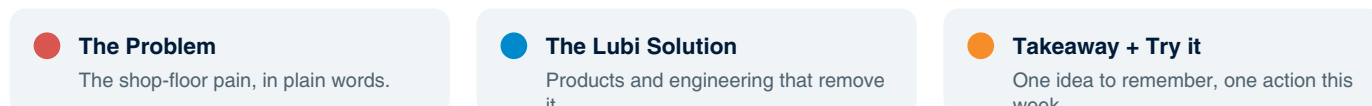
THE LINE AT A GLANCE



WHERE THE VALUE SHOWS UP



HOW TO READ EACH TOPIC



Lubi's brand portfolio includes Epson, Omron, Panasonic, Delta, Cognex, Moxa, Advantech, Inovance and more, backed by one toll-free number (1800 313 6810) for product selection, application engineering, troubleshooting and after-sales support.

Illustrative figures and diagrams in this paper are examples for explanation only. Validate them with your own plant data.

A Build it right

Assembly, inspection and welding

1

Robotic Assembly: Break the Bottleneck

Consistent fitment, every cycle

THE PROBLEM

Manual assembly of mechanical components adds variation in fitment and tolerance. Output depends on operator skill and fatigue, skilled labour is scarce, and the slowest manual station quietly caps the speed of the whole line.

THE LUBI SOLUTION

6-axis and SCARA robots take over repetitive pick, place, press and screw-fastening work. AC servo systems and motion controllers deliver precise, repeatable movement, encoders confirm position, and a PLC with HMI coordinates the cell so every part is assembled the same way.

KEY TAKEAWAY

Fix the slowest station first.

Try it: time each station for one shift. The longest cycle sets your line speed.



The tallest bar sets the pace of the whole line. Automate it first.

CASE STUDY Robotic screwing system, shown in the Lubi video showcase

6-Axis Robots

SCARA Robots

AC Servo Systems

Motion Controllers

Rotary Encoders

2

AI Vision Inspection: Aim for Zero Defects

Inspect every part, not a sample

THE PROBLEM

Visual checks by people are subjective and tiring. Defects that slip through turn into rework, line stoppages or customer complaints, and there is little data to show where and why they started.

THE LUBI SOLUTION

2D and 3D cameras with deep-learning software check presence, position, surface and dimensions in real time. Barcode readers tie every result to a part ID for traceability, and the result goes straight to the PLC to reject or re-work the part before it moves on.

KEY TAKEAWAY

Inspect 100% of parts at line speed.

Try it: list the three defects that cost you most. They become your first vision recipes.



CASE STUDY AI-Powered Vision System for Zero-Defect Automotive Quality Control

2D Vision

3D Vision

Deep Learning

Barcode Readers

Vision Software

3

Welding Automation: Repeatability at Speed

The same weld on every part

THE PROBLEM

Manual and semi-manual welding changes with operator, fixture position and fatigue. Inconsistent seams mean rework and scrap, and operators work close to heat, arc and moving parts.

THE LUBI SOLUTION

Automated cells use robot or servo-driven motion to follow a fixed, repeatable path, with speed and position under closed-loop control. Weld parameters are stored as recipes for each model, and safety light curtains guard the cell without blocking loading and unloading.

KEY TAKEAWAY

Consistency, not just speed, cuts rework.

Try it: rank welds by rework rate and automate the most repeated path first.



Recipe-driven motion repeats the same path on every part.

CASE STUDY Precision Welding Automation for Automotive Excellence

Servo Systems

Motion Controllers

Linear Guideways

Safety Light Curtains

PLC

B Run it smart

Live data, flexible changeovers and retrofit integration

4

Smart OEE Monitoring: Turn Data into Uptime

See losses while you can still act

THE PROBLEM

Without live data, downtime reasons, slow cycles and rejects are noted on paper or guessed. Managers learn about the loss at the end of the shift, when it is too late to recover the output.

THE LUBI SOLUTION

Sensors and data acquisition units capture machine states. Industrial Ethernet switches and protocol gateways bring PLC data together, and ControlX SCADA shows live OEE, downtime reasons and alerts on the HMI or a control-room dashboard.

KEY TAKEAWAY

What you measure live, you can improve today.

Try it: fill in the OEE worksheet below with last week's numbers.

OEE = Availability x Performance x Quality

Example	Availability 90%	x	Performance 85%	x	Quality 98%	=	OEE 75%
Your plant	Availability _____	x	Performance _____	x	Quality _____	=	OEE _____

CASE STUDY Optimizing Production with Smart OEE Monitoring

ControlX SCADA

Data Acquisition

Ethernet Switches

Protocol Gateways

Industrial Panel PC

5

Flexible Lines: Mixed Models, Quick Changeovers

Design for the next model, not just today's

THE PROBLEM

Different vehicle platforms and variants mean frequent changeovers. Hard-tooled stations need long reconfiguration, and every model switch costs output and invites setup errors.

THE LUBI SOLUTION

Modular cells with servo-driven adjustable fixtures, recipe-based PLC programs and vision-guided part recognition switch models by selecting a recipe on the HMI instead of re-tooling by hand. New variants are added as modules, not rebuilds.

KEY TAKEAWAY

Flexibility is built in at design time.

Try it: count changeovers per week and minutes per changeover. That is your flexibility gap.

Hard-tooled line	Stop - re-tool - restart	<i>Changeover effort (illustrative)</i>
Modular cell	Select recipe	

CASE STUDY Modular, mixed-model cells from Lubi's Automotive Line Solutions

PLC + HMI

Servo Drives

Stepper Motors

Vision Guidance

Linear Motion

6

Zero-Downtime Integration: Retrofit, Don't Rebuild

Automate around the line you already run

THE PROBLEM

Plants cannot stop production for months. Common worries are compatibility with existing machines, justifying ROI, training operators, and losing output during installation.

THE LUBI SOLUTION

Lubi engineers custom solutions around the existing line, in phases: assess, pilot, integrate, scale. Protocol gateways and serial device servers connect legacy equipment, and remote I/O adds data points without replacing controllers. Onsite support and after-sales service back every step.

KEY TAKEAWAY

Prove value in one cell, then scale.

Try it: pick a pilot station with clear pain, measurable output and few dependencies.



CASE STUDY Custom-engineered solutions for OEMs, system integrators and maintenance teams

Protocol Gateways

Serial Device Servers

Remote I/O

Consultation

Onsite Support

C

Prove it and protect it

Testing, safety and energy

7

EOL Test Automation: Every Part on Record

Pass or fail decided by data

● THE PROBLEM

Manual end-of-line testing is slow and depends on operator judgement. Results are often written by hand, so tracing a field issue back to a part or batch becomes difficult.

● THE LUBI SOLUTION

Automated test benches apply loads, measure signals and compare them with limits without operator interpretation. LabVIEW-based software logs every result against the part serial number, and test recipes cover multiple variants on one bench.

● KEY TAKEAWAY

Every part leaves with a test record.

Try it: map today's manual test steps onto the five-step flow above.



CASE STUDY Industrial Test Bench Automation Solutions (Lubi blog)

LabVIEW Programming

Data Acquisition

Pressure Sensors

Rotary Encoders

Industrial PC

8

Safety and Energy: Protected, Measured Plants

Safe plants run longer; measured plants waste less

● THE PROBLEM

Robots, presses and welding cells create safety risks, while idle motors and unmonitored panels quietly push up energy cost. Neither is easy to control by walk-round inspection alone.

● THE LUBI SOLUTION

Safety light curtains and computer-vision safety monitoring protect hazardous zones. Smart EMS with ControlX SCADA tracks energy by panel and line to expose idle use, AC drives and soft starters trim motor energy, and solar EPC options can offset grid power.

● KEY TAKEAWAY

Protect people first, then remove waste.

Try it: tick the three checks above. Every gap is a quick win.

☐ Guarded robot and press zones

☐ Energy sub-metering per line

☐ Idle-load shutdown rules

CASE STUDY Smart EMS for Industrial Energy Optimization

Safety Light Curtains

Vision Safety

AC Drives

Soft Starters

Solar EPC

CAPABILITY MAP

Which Lubi solution families support which topic

SOLUTION FAMILY	1	2	3	4	5	6	7	8
Robotics	●		●					
Drives and Motion	●		●		●			●
Vision and Barcode		●			●			●
Sensors and Safety			●				●	●
PLC and HMI	●	●	●		●			
SCADA and Software				●			●	●
Networking and Edge				●		●		
Industrial Computing				●			●	
Solar and Energy								●
Services and Support						●		

1

MEASURE FIRST

Data shows where the pain really is.

2

PILOT SMALL

Prove value in one cell.

3

DESIGN FOR CHANGE

Plan for the next model.

ROADMAP AND SELF-ASSESSMENT

From first pilot to full line



SELF-ASSESSMENT

Tick every statement that is true in your plant today

- | | |
|---|--|
| 1 ☐ Our slowest manual station limits line output. | 2 ☐ Some defects are found only after the part leaves the line. |
| 3 ☐ Weld or joint quality changes from operator to operator. | 4 ☐ We learn about downtime after the shift, not during it. |
| 5 ☐ Changing models takes long and needs manual re-tooling. | 6 ☐ Legacy machines cannot share data with our systems. |
| 7 ☐ Test results are recorded by hand or not at all. | 8 ☐ Safety zones and energy use are checked only by inspection. |

0 - 2 ticks

Targeted fixes

Pick one topic and run a pilot.

3 - 5 ticks

Focused programme

Pilot one or two cells and connect the data.

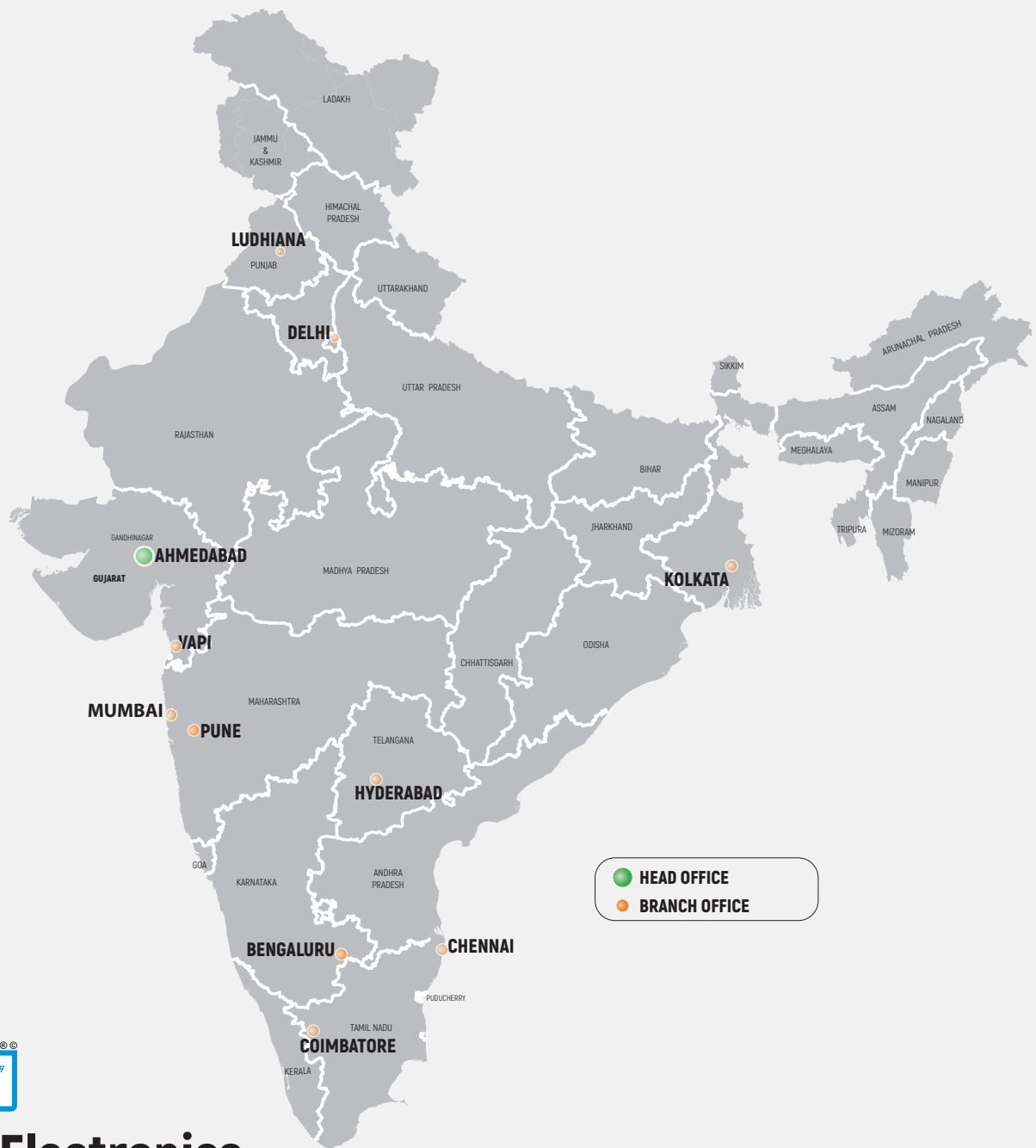
6 - 8 ticks

Line-level programme

Start with a full line assessment.

RELATED LUBI CASE STUDIES

- AI-Powered Vision System for Zero-Defect Automotive Quality Control
- Precision Welding Automation for Automotive Excellence
- Optimizing Production with Smart OEE Monitoring
- Smart EMS for Industrial Energy Optimization



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