Transitioning from Automotive to Advance Manufacturing

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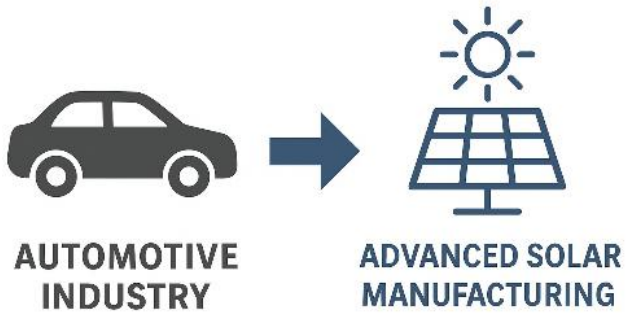
The manufacturing sector is undergoing a transformative shift, driven by rapid innovation, automation and sustainability imperatives. This article chronicles my journey from working in the automotive industry to taking on a role in solar module manufacturing. I describe how foundational skills such as lean practices, quality control and process discipline cultivated in automotive production have proved highly relevant and transferable in advanced manufacturing of photovoltaic (PV) modules. At the same time, I highlight the new technologies, materials and reliability demands in solar manufacturing—such as large-format wafers, bifacial panels, automation with IoT and data analytics, and the imperative of sustainability. Drawing on personal experience and broader industry data, I discuss how automotive-experienced professionals can leverage their capabilities in solar/advanced manufacturing, outline key lessons learned, and provide guidance for those considering a similar transition. By doing so, this piece aims to bridge the gap between traditional manufacturing domains and next-generation renewable-energy production lines, showing how the skills and mindset from one domain can accelerate progress in another.



Introduction

Manufacturing is no longer solely about mass-producing components with consistent dimensions; it is rapidly evolving into a domain where process reliability, high complexity, material innovation, digital integration and environmental responsibility are fundamental. In this context, the solar module manufacturing industry exemplifies this evolution. Meanwhile, many professionals working in automotive or other established manufacturing domains possess deep experience in precision, repeatability, waste minimisation, automation, and continuous improvement. The question I address in this article is: *How can someone with such a background transition effectively into advanced manufacturing of solar modules?*

In this article, I draw on my own career transition—from automotive production lines to the solar manufacturing plant at Reliance Industries Limited—and discuss:

(1) what is different in solar module manufacturing

(2) how automotive-manufacturing experience prepares one for the shift

(3) the challenges encountered and how they were navigated

(4) why this shift matters

(5) advice for others considering a similar path.

What's Different in Solar Module Manufacturing

In my move from automotive to solar module production, I've seen both familiar territory and many advancements. Some of the key differences include:

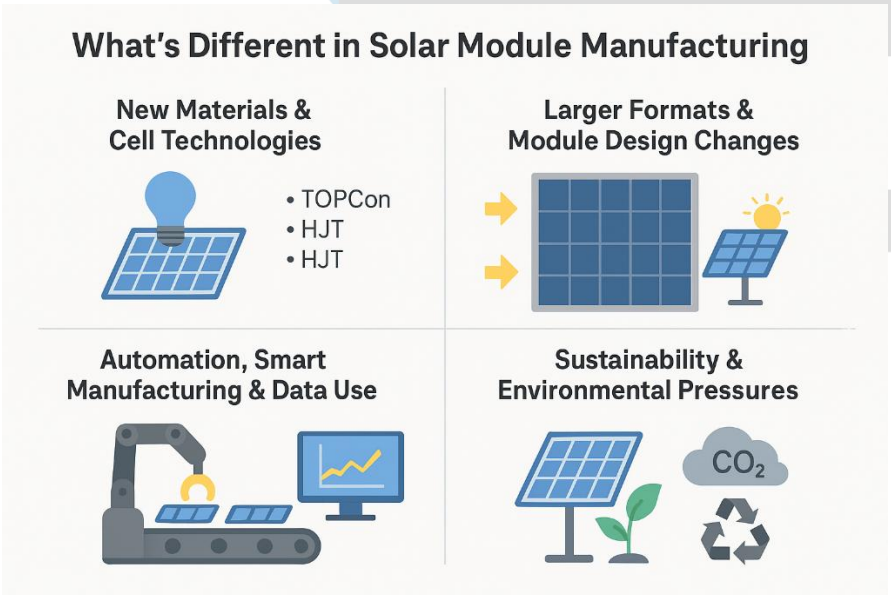
New Materials & Cell Technologies

The solar industry is driven by innovations such as TOPCon (Tunnel Oxide Passivated Contact) and Heterojunction (HJT) cells, which improve conversion efficiency and durability. For example, TOPCon uses a thin tunnel oxide and passivation layers to reduce recombination losses.
HJT cells use crystalline Si wafers with amorphous-Si layers applied on both sides, enabling high efficiencies. A recent field-study found that TOPCon modules showed lower degradation over three years in desert climates compared with HJT and PERC modules.

Thus, manufacturing in the solar domain not only requires mechanical/assembly competence but also material-science awareness, different failure modes and advanced process controls.

Larger Formats & Module Design Changes

Solar manufacturing is trending toward larger wafer sizes (for example 210 mm and beyond), bifacial panels (which capture sunlight from both sides), double-glass modules (enhancing protection and lifespan), and efficient layouts. These changes increase throughput, but also raise demands on process control, transport of large components, defect detection over larger areas, and supply-chain adaptation.



Automation, Smart Manufacturing & Data Use

Automation is as important in solar manufacturing as in automotive, but often even more heavily integrated with sensors, data analytics, IoT and machine-learning to monitor production, detect minute defects, predict maintenance needs, and optimise output. Smart manufacturing is less optional and more core.
For example: modules may be inspected via electroluminescence imaging and data logged to detect trends; IoT devices monitor machine health and operator practices; yields and scrap rates are tracked in real-time to drive continuous improvement.

Sustainability & Environmental Pressures

In solar manufacturing, there is a greater focus on minimising waste (materials, defective modules), reducing emissions in production, and optimising for longevity (so that modules generate more energy per unit of environmental impact). The choice of materials (backsheets, glass, encapsulants) is influenced by durability, recyclability and life-cycle considerations. Manufacturing processes themselves are increasingly judged not just by cost per unit, but by carbon footprint, energy consumption and end-of-life impact.

What Automotive Experience Helps Me in Solar

Because of my background in automotive, several skills and mindsets turned out to be really valuable in making this transition smoother.

1-Quality Control & Process Discipline

Automotive culture often emphasizes strict quality checks, defect tracking, precise tolerances—these are immediately useful in solar manufacturing, where microscopic defects can reduce module efficiency or durability significantly.

Example from my experience:

1- In my solar module role, reducing cell crack rejection (defect rate ~1.46 % → ~0.92 %) was one concrete outcome of applying defect detection, root cause analysis, and improved inspection processes.
2- Regular audits and line-observations (machine health, operator practices, PPE, 5S) help keep defects from creeping in.

2-Familiarity with Automation & Machine Interfaces

If you have experience dealing with robotic welders, CNC machines, or automated assembly, that helps when dealing with specialized solar cell production equipment, module laminators, or automated inspection systems.

Example from my experience:

1- I've worked with CNC / VMC / grinding / forming / serration rolling etc., and machine controls (DMG Mori, Fanuc, Okuma etc.). These helped me adapt to solar-specific machines like Stringer, EL testers, Auto Bushing, etc.
2- My lean / TPM / Kaizen / 5S background meant I was already accustomed to identifying bottlenecks and optimizing consumables, which is relevant in solar too.

3-Lean / Continuous Improvement Thinking

In automotive, reducing waste, optimizing throughput, minimizing downtime are daily concerns. In solar, these same concerns help reduce cost per watt, improve yield, and make factories more competitive.

Example from my experience:

1- I've done "communization of CNC jaws" to reduce setup times; done SMED (quick changeover) projects; tracked consumable usage and replaced combination tools. All of these helps achieve higher throughput and lower cost.
2- Also, as manager, leading team performance, audits, 5S / safety / machine health observations on shop floors made a difference in maintaining standards daily.

Challenges I Faced (and How I Navigated Them)

The transition is rewarding, but not without its hurdles. Here are some of what I experienced, and what I found helpful to overcome them.

Challenge	*What Made It Hard*	*What Helped*
Learning new solar-specific technologies / materials	*Some techniques (cell passivation, bifacial design, lamination with different materials) are quite different from car body or engine part production.*	*Hands-on learning, training, reading technical literature, working with engineers specialized in PV.*
Adjusting to different quality failure modes	*In automotive, failures might be leaks, mechanical failures; in solar, long term light-induced degradation, moisture ingress, PID (potential induced degradation) etc.*	*Focusing on long-term reliability tests, environmental testing, adopting material / design best practices.*
Meeting efficiency and energy yield targets	*There's pressure to not just make a product, but ensure it performs well for many years and in varied climates.*	*Using advanced inspection, implementing feedback loops, adjusting materials/designs.*

Why This Shift Matters (Not Just For Me)

This transition from automotive to advanced solar manufacturing has implications beyond any one individual.

Renewable-Energy Growth

Global solar capacity is rising rapidly. There is strong demand for higher efficiency, longer-lasting modules and advanced manufacturing. Professionals who can step into these roles bring value.
For example, field-data has shown that newer technologies like TOPCon and HJT are being adopted for reliability and yield.

Cost & Competitiveness

As costs come down through improved technologies (larger wafers, better materials, more automation), solar becomes viable not just for utility-scale but for rooftops, businesses and distributed generation. That means more factories, more jobs, more advanced manufacturing nodes.

For example, in India it's been observed that TOPCon has commercial advantage over HJT due to lower CAPEX and easier upgrades of existing production lines.

Environmental Impact & Sustainability

Working in solar manufacturing aligns with global imperatives: reducing carbon footprints, transitioning to cleaner energy, designing for longevity and recyclability. It offers a way to apply manufacturing experience in a domain with strong societal benefit.

Advice for Others Considering a Similar Path

If you are from automotive (or any manufacturing domain) and thinking of moving into solar or advanced manufacturing, here are some practical tips:

- **Focus on learning the new technologies** (TOPCon, HJT, bifacial modules, double-glass). Take online courses, attend seminars, engage with suppliers/manufacturers.
- **Build your understanding of material science**: Understand what kinds of glass, encapsulants, backsheets perform well for durability and longevity.
- **Get comfortable with data analytics / sensors / IoT / automation**: Knowing how to use data to detect defects, monitor processes, improve yield is becoming increasingly important.
- **Be open to adapting quality standards**: Solar modules face different reliability tests, environmental stresses, degradation modes — be ready to shift mindset from "mechanical fit/finish" to "performance over decades".
- **Stay up to date with industry trends & policy incentives**: Solar manufacturing is impacted by wafer size shifts, module format changes, subsidy regimes, trade policies — being aware helps you be relevant.
- **Leverage your existing skills actively**: Don't assume everything is different. Your skills in lean, process discipline, quality audits, automation interfaces are valuable. Find where they map and where you need to adapt.

Stay up to date with **industry trends**, policy incentives (solar subsidies or manufacturing incentives), because markets shift quickly.

Conclusion

Transitioning from automotive to advanced solar manufacturing isn't just a change of workplace, it's a shift in mindset. A move from conventional heavy manufacturing to a domain that blends environmental responsibility, innovation, cutting-edge materials, and performance under demanding conditions.

But for someone with automotive experience, many skills you already have are highly relevant and valuable. With willingness to learn, adapt, and engage with new technologies, you can make a meaningful contribution in this fast-changing field—and be part of building the renewable future.

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