

TAIYANGNEWS

ALL ABOUT SOLAR POWER

Market Survey on Solar Module Production Equipment 2026

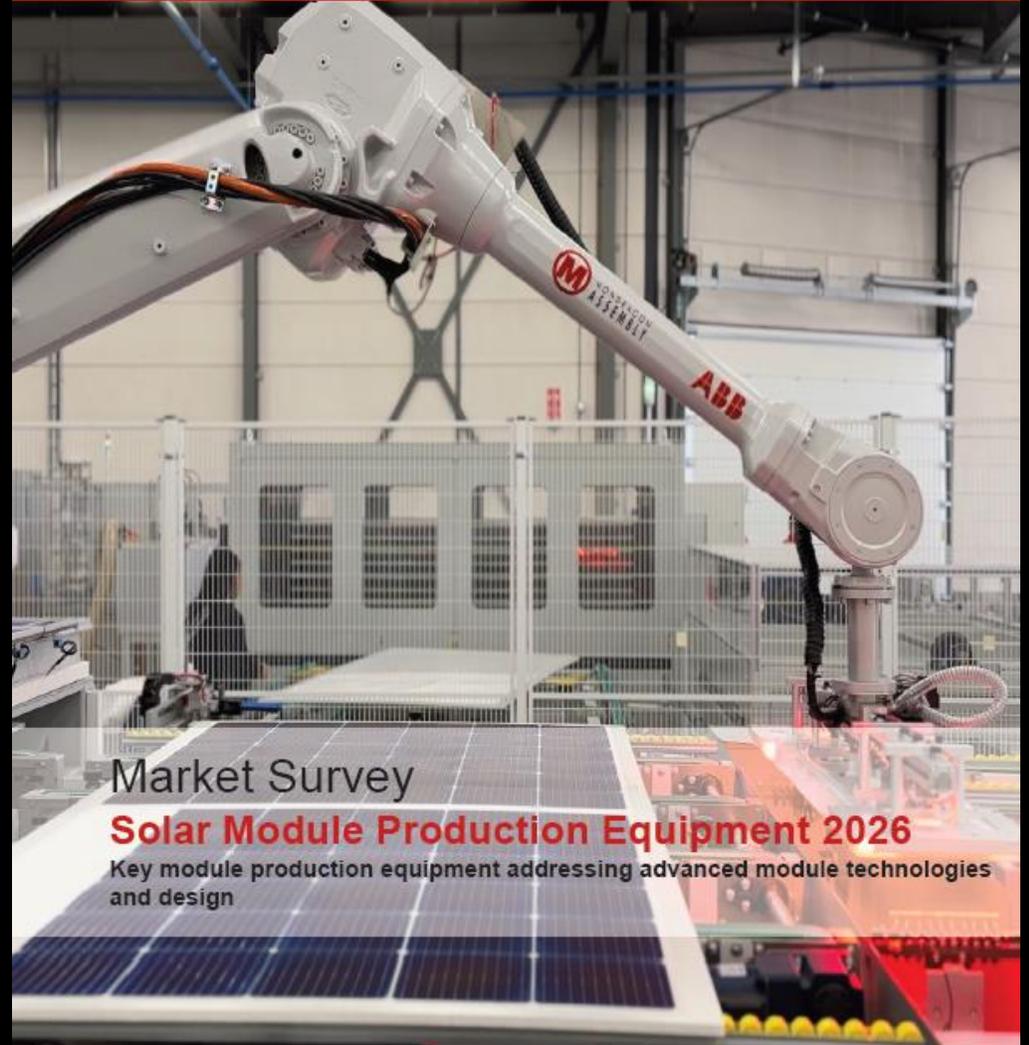
Shravan K. Chunduri

Head of Technology,

TaiyangNews

TAIYANGNEWS

ALL ABOUT SOLAR POWER



Market Survey

Solar Module Production Equipment 2026

Key module production equipment addressing advanced module technologies and design

Authors: Shravan K Chunduri, Michael Schmela



Key Production Equipment Addressing Advanced Module Technologies and Design

- We identified 2 real processing equipment – *CTS* and *Laminator*
- *Auto-layup* and *auto-bussing*, both automation equipment, were selected due to their sensitivity to module technologies
- Optimization of sun simulators to characterize high capacitance and a wide range of technologies with an LED source adds to the relevance

Contents

01

Introduction

7

02

Overview

8

- 2.1 Process Flow
- 2.2 Survey Participants
- 2.3 Marketing Positioning

03

Trends in Module Production Equipment

21

- 3.1 Interconnection
- 3.2 Auto-Layup & Auto-Bussing
- 3.3 Lamination
- 3.4 IV Characterization

04

Product Descriptions

28

- 4.1 Combined Tabber and Stringer
- 4.2 Auto Layup
- 4.3 Auto Bussing
- 4.4 Laminator
- 4.5 Sun Simulator

05

Conclusions

58

06

Product Specification Tables

60

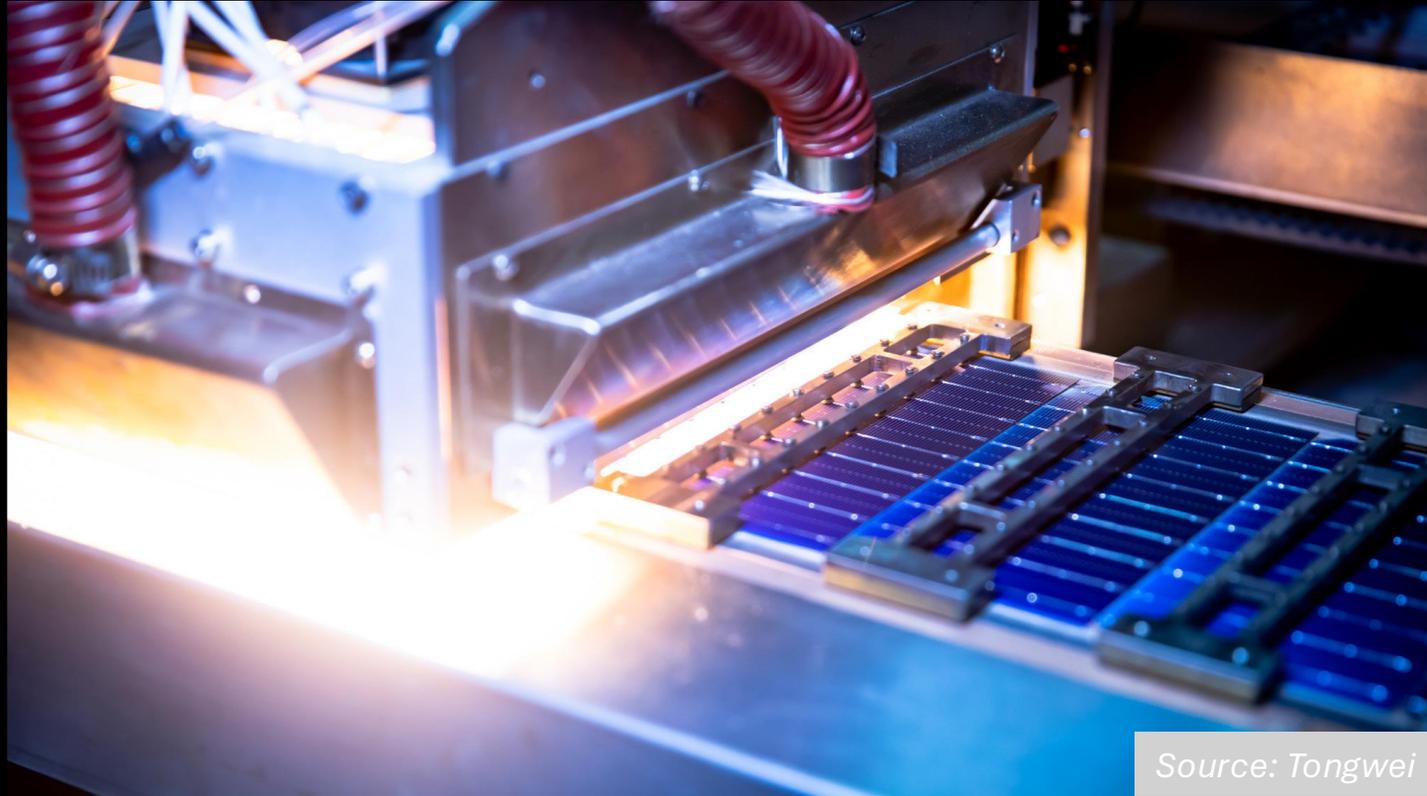
Survey on equipment from Chinese and European manufacturers

- In this survey, a total of 9 companies participated by sharing their product information
- Several of these are established players in offering the key equipment of interest in this survey
- For many, the top market of interest is India, followed by the US and Europe
- These equipment support the production and characterization of various module technologies

Manufacturer	CTS	Auto-Layup	Auto-Bussing	Laminator	Sun Simulator
Wuxi Autowell Technology	✓	✓	✓		
Avalon - Pasan					✓
Hangzhou ConfirmWare Technology	✓	✓	✓		
halm elektronik					✓
Jinchen Machinery	✓	✓	✓	✓	
MBJ Solutions					✓
Mondragon Assembly	✓	✓	✓	✓	
Robert Bürkle				✓	
XN Automation	✓				

Technology Trends – OBB

- Motivation for OBB in recent times was to reduce silver consumption
- A process step very easy to achieve at the cell level poses high complexity at the module level
- CTS especially faces challenges in connecting cell fingers to the ribbons
- Equipment and module manufacturers' observations:
 - Process complexity
 - Low production yield
- Retrofit upgrades are available for OBB processing with current lines, at about 50% of the equipment cost (for one specific manufacturer)



Source: Tongwei

Technology Trends – Multi-cut

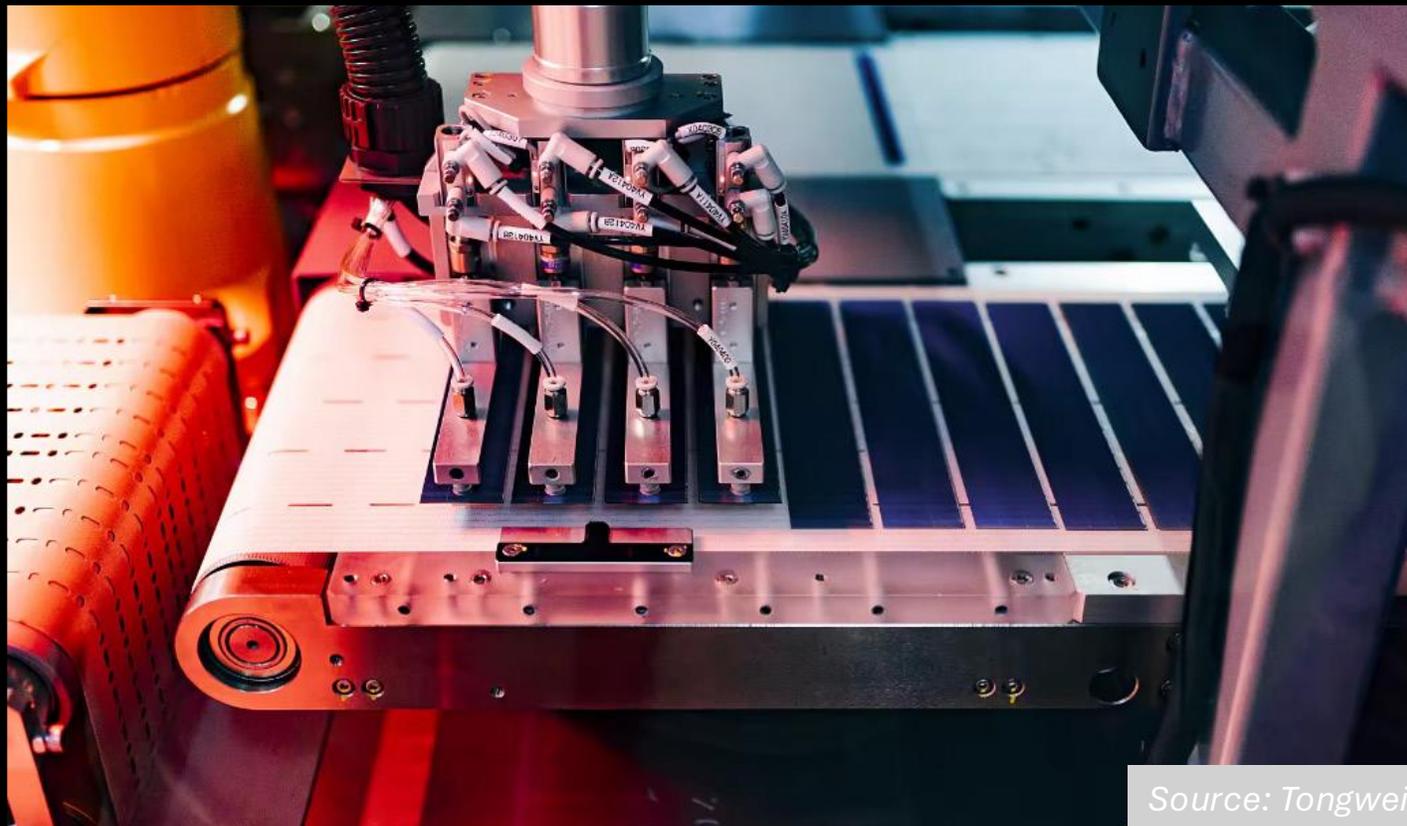
- A module-level design change, multiple cell slicing improves the distribution of current
- One of the equipment manufacturers noted a decrease in the number of busbars from 24 to 16 by adopting 1/4-cut cells
- Retrofit upgradable option available to process multi-cut cells, with 20-30% of equipment cost
- Busbar count fluctuation may repeat, reaching even 30+BB configurations in the future



Source: Jinko

Technology Trends – BC

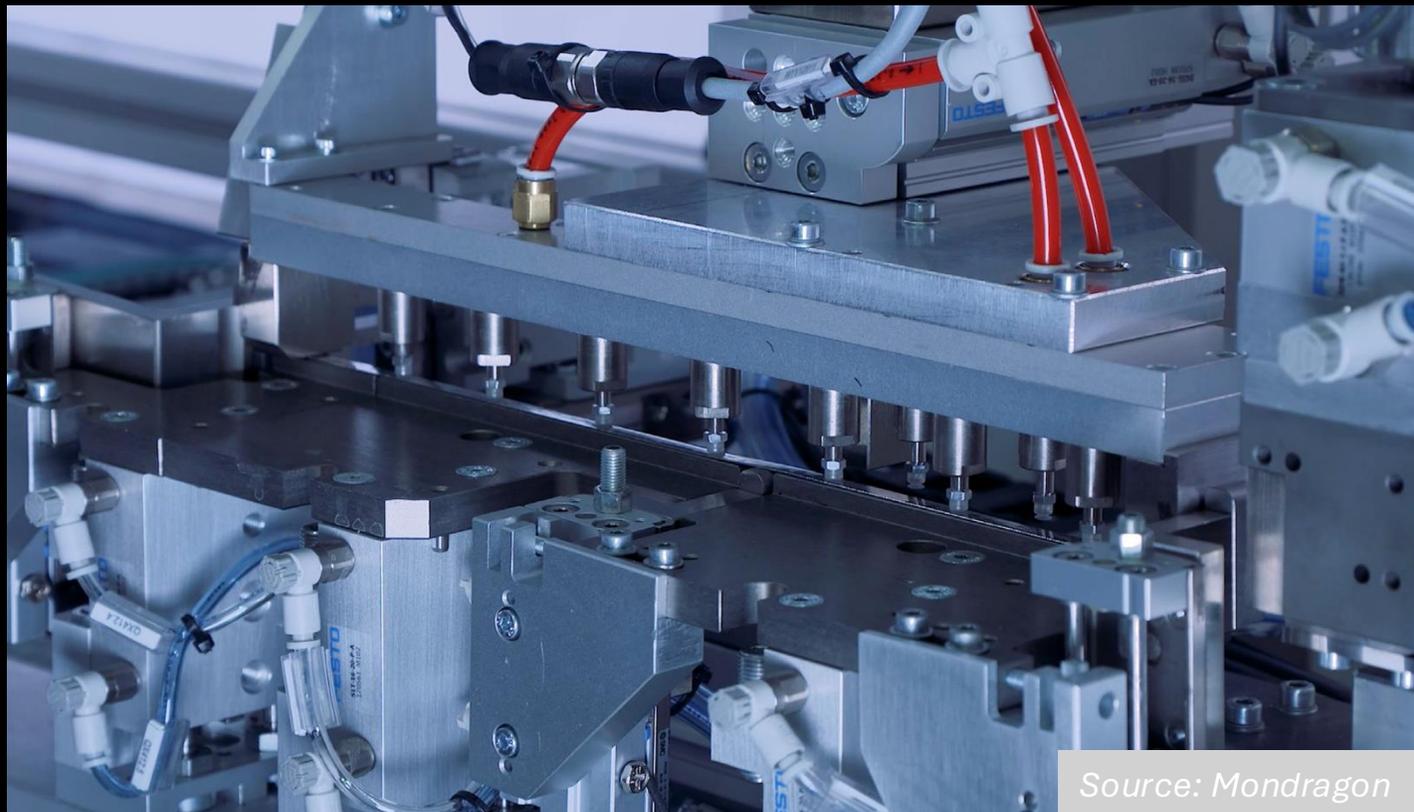
- Complex at the cell-level and equally challenging at the module line to process
- However, most of the current mainstream CTS suppliers have adapted to this technology and offer machines compatible with BC interconnection



Source: Tongwei

Auto Layup and Bussing Trends

- Auto-layup and auto-bussing, mostly dependent on the string and module designs, have widely adapted to changes over the years, such as reduced or wider inter-string spacing



Source: Mondragon

Laminator Trends

- Laminators have been robust equipment throughout all these technological evolutions at the cell and module levels
- Optimizations for throughput improvement resulted in multi-stacked, double-stacked large area, and with 3-stage processes
- Further developments in terms of low-temperature lamination requirements need to be explored, as the roadmap for tandem technologies in the future is widely adopted
- Other solutions with intelligent solutions to prevent and resolve situations of unsuitable lamination environment and materials are being explored



Sun Simulator Trends

- LEDs are cheaper alternatives to the traditional xenon-based sun simulators
- They are better in terms of lamp life, with more than 30 million flashes, compared to a xenon lamp's few hundred thousand flashes
- Bifacial, thin-film, perovskites, and IBC technology modules are also measured using the LED-based simulators
- LEDs are largely replacing the Xenon-based, which are still
- Xenon, however, still remains critical for reference-grade measurements



Source: MBJ Solutions

Conclusions

- This first survey on Module Production Equipment highlights the importance of evolution in assembly line machines
- Machines have been constantly improving beyond throughput, uptime, and yield, to cater to evolving cell and module technologies and designs
- With flexibility at heart, these continue to adapt to ever-changing requirements of the PV industry
- Tandem, multi-cut cell processing, and IPV technologies seem to be the next steps



Source: Jinko

TAIYANGNEWS

ALL ABOUT SOLAR POWER

Thank you

Shravan K. Chunduri

Head of Technology

shravan.chunduri@taiyangnews.info

