CORE CONCEPT

Solar PV Module Manufacturing Course: Stringing, Lamination, EL Testing and Quality Control

7 – 11 June 2027
London - Central London four-star

Solar PV Module Manufacturing Course: Stringing, Lamination, EL Testing and Quality Control

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Introduction:

Solar PV module manufacturing, from stringing and lamination to EL testing and quality control, is the subject of this 1-week course for production, process and quality assurance engineers, ending with a Module Line Quality and Yield Improvement Plan. Module plants lose output and warranty margin when cracked cells, poor solder joints, under-cured encapsulant and mis-binned power classes pass unnoticed between stations. Nominees already run, adjust or inspect a cell-to-module line, and teaching is by inspection walkthrough of stations, EL images and flash test records. CoreConcept Training Center delivers this solar PV module manufacturing course.

Course Objectives:

- Map a crystalline silicon module line from cell receipt to packing and locate where each defect type is created
- Set stringer soldering, layup and laminator recipe windows that hold interconnect strength and encapsulant cure
- Classify electroluminescence images and visual defects against written acceptance criteria at each inspection point
- Run flash testing at standard test conditions and apply power binning rules consistently across shifts
- Relate line controls to the design qualification and safety requirements of IEC 61215 and IEC 61730
- Build a Module Line Quality and Yield Improvement Plan with control points, OEE targets and owners for a case line

Target Audience:

- Production engineers responsible for stringer, layup, laminator and framing station output
- Process engineers who set soldering, encapsulant curing and junction box potting parameters
- Quality assurance engineers who define inspection criteria and release finished modules
- Test engineers who operate electroluminescence and flash test stations and maintain their calibration
- Line supervisors accountable for shift yield, scrap records and reaction to rejects

Course Outline:

Day 1: Module Construction, Cell Technologies and Line Flow

- Crystalline Silicon Module Bill of Materials and Layer Stack
- PERC, TOPCon and Heterojunction Cell Handling Differences
- Glass-Backsheet versus Glass-Glass Module Construction Trade-Offs
- Cell-to-Module Line Flow Map from Receipt to Packing
- First-Pass Yield and Scrap Baseline by Line Station

Day 2: Qualification Standards, Electrical Rating and Acceptance Criteria

- IEC 61215 Design Qualification Test Sequence and Failure Modes
- IEC 61730 Safety Requirements for Construction and Insulation
- Standard Test Conditions Flash Testing and Power Binning Rules
- Electroluminescence Image Classes for Cracks and Dark Cells
- Visual Inspection Sheet for Bubbles, Misalignment and Contamination

Day 3: Stringing, Layup, Lamination and Final Assembly Control

- Incoming Cell Sorting by Efficiency Bin and Colour
- Stringer Ribbon Soldering Temperature, Flux and Peel Test Control
- Layup Cell Gap, Bussing Ribbon and Interconnect Placement Checks
- Laminator Recipe Setting for EVA and POE Encapsulant Curing
- Frame Sealant, Junction Box Potting and Bypass Diode Checks

Day 4: Defect Diagnosis, Reliability Risks and Line OEE

- Microcrack Root Causes Traced Through Handling and Stringing Stations
- Gel Content and Peel Strength Tests for Lamination Quality
- Potential-Induced Degradation and Damp Heat Failure Risk Review
- Cell-to-Module Power Loss Ratio Analysis After Flash Test
- Line OEE Loss Tree for Availability, Speed and Quality

Day 5: Inspection Walkthrough and Module Line Quality and Yield Plan

- Case Module Line Walkthrough Against Station Acceptance Criteria
- Case EL and Flash Test Reject Pareto Review
- Control Plan and Reaction Rules for Critical Stations
- Yield and OEE Improvement Targets with Named Action Owners
- Module Line Quality and Yield Improvement Plan Completion

Skills You Will Gain:

- Module Line Flow Mapping
- Solder Joint Quality Control
- Encapsulant Cure Verification
- Electroluminescence Image Interpretation
- Power Binning Discipline
- Module Qualification Awareness
- Microcrack Root Cause Analysis
- Line OEE Loss Analysis

Why Attend This Course:

- Deliver a Module Line Quality and Yield Improvement Plan to the plant manager and the quality lead
- Decide whether a reject trend calls for a stringer, laminator, material or inspection change
- Avoid field returns, warranty claims and failed qualification retests caused by hidden cell cracks and weak cure
- Coach operators and inspectors on reading EL images, flash test curves and station records the same way

Conclusion:

Back at work, the participant presents the Module Line Quality and Yield Improvement Plan to the plant manager, the quality lead and the process engineering team, who use it to set station acceptance criteria, recipe windows, reaction rules and OEE targets for the line. Inspectors apply its EL and visual criteria to separate stringing, lamination and material causes of rejects. After the first full production month under the plan, the unit should compare first-pass yield, power loss ratio and reject Pareto results with its targets and revise the controls that did not deliver.

Frequently Asked Questions FAQ:

What should participants know before a solar PV module manufacturing course?

Participants should already run, adjust or inspect stations on a module assembly line and read production records. No semiconductor physics background is needed. Bringing anonymised EL images, flash test data or reject logs from their own line makes the walkthroughs more useful.

How does a solar PV module manufacturing course differ from a solar plant design course?

It concentrates on building and testing modules inside a factory: stringing, lamination, framing, EL and flash testing and line yield. Plant design courses cover string sizing, inverters, grid connection and field operation of installed arrays, which appear here only as the customer context.

Why is electroluminescence testing used in solar PV module manufacturing?

Electroluminescence imaging shows cracks, broken fingers and inactive cell areas that are invisible to the eye and may not yet reduce flash test power. Testing before and after lamination locates the station that caused the damage.

What do participants take back from the solar PV module manufacturing course?

Participants take back a Module Line Quality and Yield Improvement Plan, plus a line flow map, an EL defect classification sheet, a laminator recipe check list and an OEE loss tree adaptable to their own plant.