DEVELOPMENT OF AN AUTOMATIC PRODUCTION LINE FOR PVA WITH A CAPACITY OF 200.000 SOLAR CELLS PER YEAR

I BACKGROUND

DHV Technology has developed a complete production line for photovoltaic assemblies (PVA) with a capacity of 200,000 solar cells per year. This development involved creating automatic equipment, qualifying new processes, and integrating and commissioning all these elements. DHV Technology has successfully implemented two automatic systems: the automatic inspection of solar cells (AISC) and the automatic welding process for string formation (AWSF).

AISC system

AWSF system

II RESULTS

The AISC system automatically takes each solar cell from the provider's carrier, performs a visual inspection to detect possible defects such as small breakages and bubbles in the adhesive between the coverglass and the solar cell, and conducts an electroluminescence (EL) test to identify microcracks and inhomogeneous areas within the cells. This tool is essential for ensuring the quality standard of the PVA. The AISC system can process 200,000 solar cells per year, operating two shifts per day.

The AWSF system handles the welding process required for string formation. It is equipped with one welding head but is designed to operate with two. With one head, the system can process 100,000 solar cells per year in two shifts; with two heads, it can handle 120,000 units per year. The AWSF uses a parallel gap welding process qualified for space applications, ensuring the traceability of each weld. It can process solar cells of various sizes, including 26 cm², 30 cm², and 77 cm².

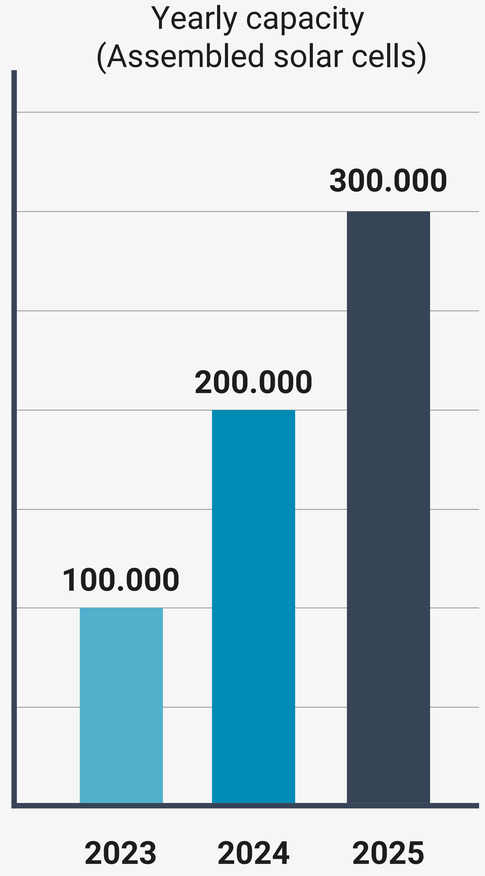
Once the solar cell strings are manufactured, an EL test at the string level ensures the process has been conducted under nominal conditions. In 2024, DHV Technology is qualifying a process for an RTV (room temperature vulcanization) adhesive, which will automate the adhesive process.

A new pick-and-place automatic system, also with a capacity of 200,000 solar cells per year working two shifts, is being developed. The production line is completed with an automatic electrical test (AET) system for solar panels, acquired from a vendor and AAA certified for temperature, homogeneity, and spectrum. This system is balanced to handle 200,000 solar cells per year in two shifts.

III CONCLUSIONS

All automated systems collect information on each process and its results, indexing them in a main database to ensure complete traceability. This traceability covers everything from the introduction of cells into the inspection area to the final product output, and it is all done entirely digitally. This automation concept not only ensures full process traceability but also relies on the principles of Industry 4.0, integrating advanced technologies and connectivity to optimize efficiency and precision at every stage of production.

INDUSTRIALIZATION PLAN



SOLAR PANEL MANUFACTURING

- PVA & Laydown
- Wiring
- Substrates
- Deployable solutions

AUTOMATED PROCESSES

- Automated solar cells inspection
- Automated welding process
- Automated adhesive application
- Automated pick & place of strings

TESTING CAPABILITIES

- 0g-MGSE for Deployments
- TVAC
- APTC
- Solar simulator
- Vibration Shaker

MAIN OFFICE

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