

# SUCCESS STORY



## Cell processing

### RENA sets new standard in solar cell production

The newly developed fully automated InOxSide inline process line integrates edge isolation with phosphor glass etching and offers solar cell producers decisive cost and quality advantages. Reduced breakage due to simplified handling.

#### The situation

The raw material pure silicon is becoming scarcer and more expensive worldwide. Our analyses show that the market requires a powerful process automation solution, particularly for edge and phosphor glass etching, in order to be able to effectively meet rising demands for more efficient solar cell production. This necessitates rethinking the entire process chain. Most present production processes required individual and separate process steps, for which process tasks such as saw damage etching and texturing of the wafers took place via automated roller transport. The process step of edge isolation has hitherto proved impossible to solve via roller transport. After diffusion, each individual solar cell had to be removed, transported, stacked and fed to an equipment. The edge etching, carried out in individual batches, also took place under mechanical pressure, representing an additional potential source of defects - and thus rejects. The consequence: each interruption of the production chain not only meant a high handling effort - and thus costs - but also high breakage rates.



RENA automation solutions for the solar industry combine process and equipment support based on years of our own research and development.

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Subject to change.

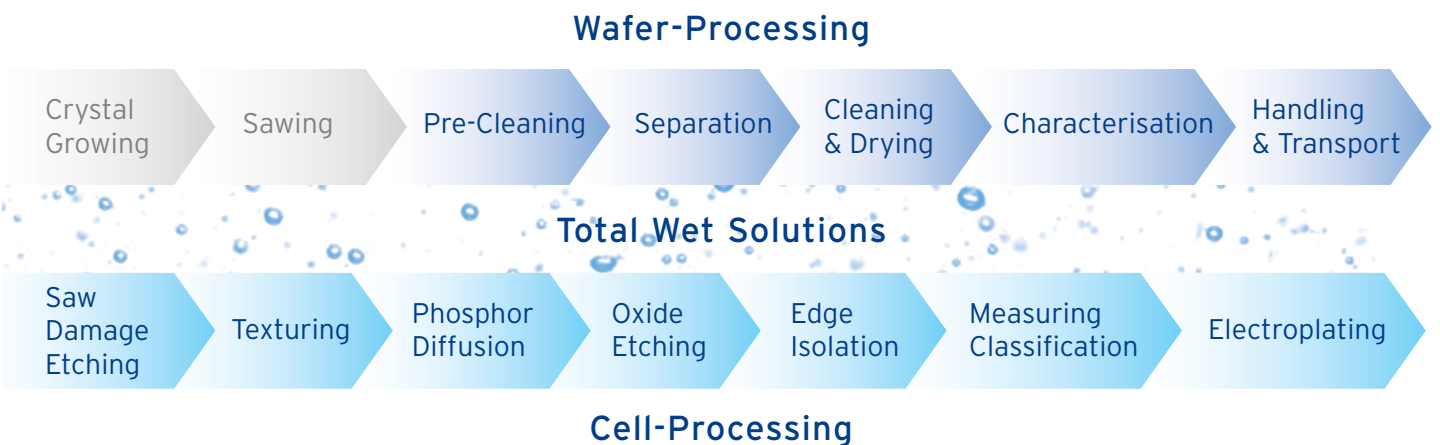
The information in this document contains general descriptions of the technical possibilities. The desired performance features of the equipment and process solution therefore require individual definition.

## The solution

In close collaboration with our customers we have achieved a completely new solution for edge isolation. Whereby the cells are transported horizontally on rollers in parallel processing lines. During the edge etching process step the entire wafer bottom, as well as the sides, are etched in a chemical bath - until the approx. 1  $\mu\text{m}$  thick n-doped silicon layer has been completely removed. Only in this way can electrical insulation be ensured between the n-doped and p-doped sides of the cell. A central requirement hereby is that the diffused upper surface of the solar wafer, which is only approx. 200  $\mu\text{m}$  thick, cannot come into contact with the etching liquid in the bath. As a result of the precise wafer transport, and physical effects, the wafer's upper surface remains dry while the bottom side is etched. Thus RENA can guarantee that the emitter is not damaged.

## The benefits

With this solution, which is unique, RENA has succeeded in automating the important process step of edge isolation using wet-chemical inline processing - and thus considerably minimised the transport effort between the process steps of phosphor glass etching and the subsequent edge etching process. Combining edge etching with the oxide etching process in one inline equipment reduces the breakage rate thanks to simplified handling, and allows optimum integration of the process in the complete production line. The process, developed in just 8 months and awarded the Innovation Prize by the state of Baden-Württemberg, sets a new technological standard in solar cell production. For cell producers it opens up the possibility of exploiting important cost savings and rationalisation advantages.



## Overview of advantages

- Reduced breakage thanks to fully automated cell production (no stacking and manual wafer handling)
- Integration of two process steps in a single equipment
- Greater efficiency
- Improved cost of ownership
- Reproducible process results, greater throughput and assured product quality

## InOxSide technical data

- Edge Isolation & Phosphor glass etching**
- 8-lane equipment for 156 mm wafers
  - Gross throughput: up to 2,000/h / 3,000/h (156 mm / 125 mm wafers)
  - Applicable for very thin wafers (from 300  $\mu\text{m}$  > 120  $\mu\text{m}$ )
  - Length process line: 7350 mm
  - Depth process line: 2450 mm
  - Complete process and equipment solution