

SUCCESS STORY

Solar wafer processing

Progress through inline processing

The newly developed automation concept for wafer cleaning reduces the handling effort required and increases throughput - offering decisive competitive advantages.

The task

Producers of solar wafers are principally measured by output that is as high as possible and reproducible process results. Previous wet-chemical cleaning processes had the disadvantage that they necessitated wide-ranging manual interventions within the process chain. Every single wafer had to be collected, transported and fed into the next process stage in up to 20 individual steps. The often several hours lasting cleaning process resulted in impermissible product qualities and limited throughput caused by high breakage rates. The breakage rate rose further because wafers became increasingly thin as a result of a growing scarcity of silicon. While the wafers were still 270 - 300 μm thick in late 2004, today's silicon wafers now have a thickness of 200 - 240 μm . Against this background, the customer gave us the task of fundamentally re-thinking wafer processing: RENA was to develop a cleaning solution that united all the previous processing steps, substantially reduced the number of rejects, and significantly increased the throughput that could be achieved. Whereby it was necessary to combine a high level of automation with the potential for manual process interventions.

Fully automated
inline wafer cleaning



The solution

RENA's development engineers went to work on the aim of optimising the complete process chain following sawing. Within a few months, an individual package was developed in collaboration with the customer, with which wafer could in future be produced quicker and more reliably. The original intention of automating all the process steps in a chained system would only have brought about a minor increase in wafer throughput, but made manual intervention impossible. At the core of the new inline wafer cleaning system, therefore, there is a technical separation of pre-cleaning and main cleaning processes. Whereby pre-cleaning and separation of the wafer from the saw holder are not directly connected with further inline processing. The newly developed equipment concept integrates the complete inline process chain consisting of the components: WaSep separation, InWaClean with up to 10-lane inline cleaning, the WTS Wafer Transfer System

with 10 lanes, and single lane wafer characterisation from Hennecke. The transport and handling tasks required after sawing, which used to be largely carried out manually, are fully automated in RENA's inline solution.

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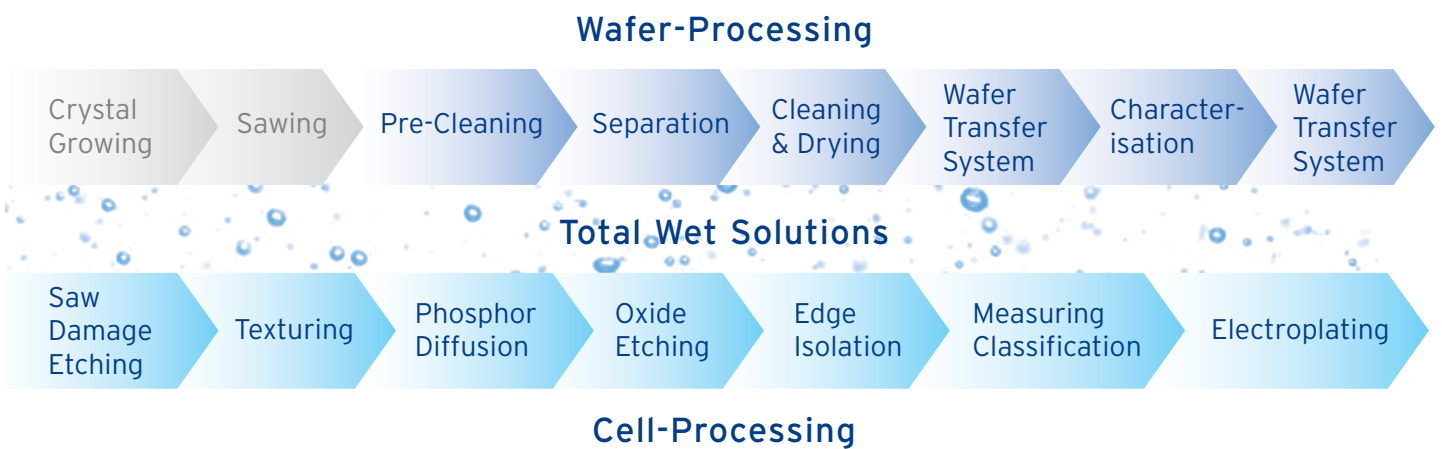
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The information in this document contains general descriptions of the technical possibilities. The desired performance features of the equipment and process solution therefore require individual definition.

The benefits

The RENA inline process line achieves gross throughputs of up to 3,200 wafers/hour depending on the wafer type. With a breakage rate reduced by more than 50%, reproducible results, and consistent high product qualities it opens up new cost and competitive advantages for producers. With wafer cleaning from RENA, producers can immediately assess the success of the process step. Producers can rapidly react to results at any time thanks to the potential of manual intervention. A substantially increased level of automation not only reduces unit wage costs, but also results in considerably fewer rejects due to the greatly reduced breakage rate - a not inconsiderable factor in view of the increasing scarcity of silicon resources. Wafers with a thickness of 200 µm have been successfully tested on this

process line. So far RENA has been able to deliver 5 inline equipments with this technology worldwide. More are currently under construction or are about to be commissioned. RENA thus covers the entire process chain from the sawing phase onwards, and can offer producers complete wet-processing for wafer and cell production. This also includes complete automation with wafer feed, handling and transport. Test equipments at RENA's application laboratory are available for customers to optimise their processes. Inline process lines from RENA ensure a state-of-the-art quality standard - with complete process transparency with lower production costs per wafer. Ideal prerequisites for meeting future demands in the solar growth market.



Cost-of-Ownership

- Reduced production costs
- Reduced personnel costs
- Throughput up to 50 MW/a
- Reduced costs per Wp
- Breakages reduced by 50 %

Technical data

- Equipment chain for separation, cleaning, wafer transport and characterisation
- Gross throughput: 2000 / 3000 wafers per hour (156 mm / 125 mm wafers)
- Process and equipment development from a single source
- Processing with low use of chemicals
- Process optimisation at RENA's own laboratory