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Every incremental saving assists manufacturers achieve the cost effectiveness of their products to be able to increase market acceptance. Even the amount of material and chosen process in assembling solar modules can provide invaluable savings to the overall cost. **Schmid Technology Systems** discusses the latest Tabber Stringer the company is offering the industry with a view to provide a more cost effective and productive method of assembly.

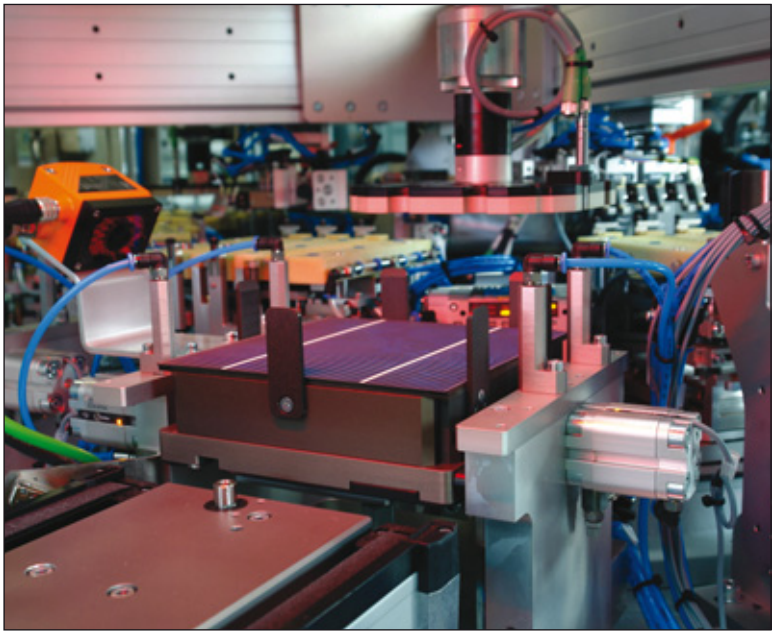
Schmid Technology Systems has developed a new design and concept for tabber stringers, created in cooperation with the Wolf company, that deliberately moves away from the traditional method of soldering ribbons to solar cells. The successful partnership between Schmid and the company Wolf Produktionssysteme has already existed for several years with a number of successful collaborations. Wolf Produktionssysteme's expertise is in the construction of speciality machinery for automating assembly and special soldering processes. They were the ideal partner for Schmid in the new development of Schmid's own Tabber Stringer. The companies developed an exclusive agreement at the end of 2008 with a view to develop the new system.

This new system has a number of innovative additions with a high precision performance combined with minimum cell handling and a soldering method that radically reduces the risk of cell damage as well as reduces solder waste. The new Tabber Stringer has also being designed with floor space and cost in mind with a space saving footprint of only 3.3 mÇ and an attractive price of 590,000 ?.

Tabbing and Stringing Process

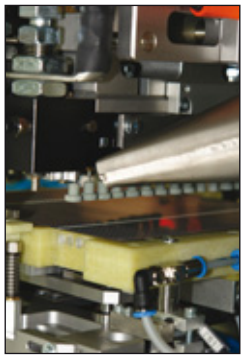
In this new system jointly developed, the tabbing and stringing occurs in two distinct steps. The tabbing unit is equipped with a turntable that very precisely indexes the cells to the individual processing stations. Initially, solder ribbon for the rear side of the cells is drawn from a roll, flux is applied to it over a flux bath, then the ribbon is affixed in a frame on the turntable and finally cropped. Then the turntable is indexed to the next step in the process. Solar cells are then introduced to the machine by means of a transport carrier and separated using separation nozzles. The cells are taken by a suction gripper and placed sunny side up on the prepared solder ribbon on the turntable. A camera checks the exact orientation of the grids in relation to the ribbons. In the next process step, the solder ribbons are prepared for the front side of the solar cell.

When the solder ribbons and cell are exactly positioned, the turntable indexes further to the soldering position. Here only the upper soldering ribbons are contacted. The solder is melted by means of resistance heating and the solar cell is fused with both the front and the back soldering ribbon. The vacuum plates of the turntable, which permanently hold the cells and the solder ribbons



Source: Schmid Technology Systems GmbH

Cells are introduced to the machine by means of a transport carrier and separated using separation nozzles



Resistance Soldering
Source: Schmid Technology Systems GmbH

in position, are kept tempered during the entire process. Thus the difference in temperature between cells and bus bars during the soldering is decreased, what results in a minimization of the thermal stress in the cells and therewith in breakage risk reduction. Finally the bus bars are cut to the correct length by a cutting unit. Thereafter, a camera checks the tabbed cells for breakage, those that are found to be undamaged are passed to a flip unit by means of a gripper system and are placed sunny side down on the stringer axis. Damaged cells are placed in a box provided for that purpose. The tabbed cells are held exactly in position on the stringer unit, sunny side down on vacuum tables, and then soldered together using a laser. Finally, the stringer advances the finished string to the hand-off position and transfers the string to the Schmid-owned Layup Station for further processing.

Tabbing and stringing is carried out in two steps whereby minutely exact positioning of the solder ribbons on the rotating table of the tabbing unit and highest repetition precision are guaranteed. The accuracy of cell positioning along the linear axis in the stringer unit allows production of one-hundred percent straight and regular strings for the first time ever.

The minimization of the cell and string handling from formerly seven times now down to only two times as well as the use of different stations for quality control prior to and during the process and the automatic rejection of defect cells ensure a constant level of high quality while preventing the production of faulty strings.

Camera checks the exact orientation of the grids in relation to the ribbons

Source: Schmid Technology Systems GmbH

Soldering System

The combination of the soldering processes resistance heating and laser beam soldering is a new feature of this application. Both these soldering methods can be carried out non-polluting lead-free and are characterised by highest-level accuracy, repeatability and lowest possible maintenance requirements.

Resistance soldering

The bonding of the ribbons to the cells is done my means of resistance heating in the tabbing unit. By electric current input into the ribbons heat is produced at the soldering points. In doing so the ribbons are heated from inside within tenths of a second and consequently serve as a soldering-iron. The contactless heat input into the ribbons and the bus bars of the solar cells in connection with the short process duration under 1.5 seconds reduce the temperature input including the thermal stress to a minimum. The uniform temperature profile generated along the entire solder ribbon–bus bar connection during this process creates a homogenous, high quality solder result.

Laser beam soldering

In the second process step the tabbed cells are then connected in series to create strings, again by means of non-contact laser beam soldering, in doing so strings up to a maximum length of twelve cells are created. The bus bars get pressed all around the soldering point by the help of feather-pressure and get punctually and quickly bont together via PID controlled diode laser, without causing thermal stress to the cells.

The new Tabber Stringer combines strong output performance (1,200 cells per hour) with a minimum breakage rate (< 0.3 %) and space-saving design. An upgrade of the module production line from 25 MW to 50 MW can be accomplished at low cost and little effort and does only require minimal additional space for the second Tabber Stringer.

The Layup Station is already prepared for this upgrade and does not need further floor space. The possibility of processing very thin cells from 130 Ìm and back contact cells also makes the system an extremely interesting solution in view of current developments in solar cell production. For special needs the application of different types of ribbons on the front and the back of the cells is possible. Schmid will deliver the first Tabber Stringer to customers as early as January 2010.