Size Matters!

The photovoltaics market continues to grow: the cumulative installed PV capacity in Europe reached 151.7GW at the end of 2020. The potential for both residential and commercial applications is still huge. But the market requirements change. In addition to larger modules with higher outputs, visual aesthetics play an increasingly important role. This also influences the requirements for assembly systems. PES spoke with Christoph Dorscht, Head of Mounting Structure Division of IBC SOLAR, to discuss current trends and why size certainly matters.

PES: Welcome back to PES. For the benefit of our readers, would you like to introduce the company and briefly explain how you serve the PV industry?

Christoph Dorscht: IBC SOLAR is a provider of photovoltaic and energy solutions offering tailor-made systems ranging from individual solar panels to complete PV systems. For almost 40 years, our company has shaped the development of solar energy as a source of regenerative energy and implemented photovoltaic systems with an output of 5,4 gigawatts throughout Europe and around the globe.

Together with more than 1,000 specialist partners worldwide we support clients from planning to fulfilment of photovoltaic systems. We attribute great importance to choosing the best suited solutions. This includes the quality of each component as well as optimal pairing of components, which we also test extensively.

PES: This sounds like you are a step closer to current customer and installation demands or trends than other system manufacturers. What trends do you see in PV and mounting systems?

CD: A very visible trend, especially in the residential market, are the growing aesthetic requirements. In the early years of photovoltaics, homeowners made the decision to install their own rooftop PV system, based on their conviction in sustainable power generation.

Therefore initially, little attention was paid to the look of the PV system. Thanks to the lower prices of photovoltaic systems in recent years, this changed. Today home-owners do not only expect their PV systems to be regenerative and sustainable, but also to look good. Therefore, more and more systems are introduced to the market to meet this demand.

Christoph Dorscht

Take a look at current PV modules on the market. The cells of the modules are becoming more and more homogeneous in their appearance. Black modules are very much on trend in the residential market. For home-owners PV systems are increasingly becoming more significant. But a sleek and elegant look cannot be achieved by modules alone. It requires corresponding assembly systems. All system components form a unit and have to fit together perfectly, not only for the sake of safety and efficiency, but also for aesthetics.

Of course, there are also a number of more technology related or law and 'standard' driven developments.

PES: You mentioned efficiency, what trends do you see in this area?

CD: With regards to cell technology the market evolved from BSF cells (Back Surface Field) to PERC cells (Passivated Emitter and Rear Contact), which today have a market

share of approximately 90 %. But with an efficiency of around 22 %, the record is 24,06 %, PERC cells are reaching their technological limits. We are now observing a new emerging cell type called TOPCon.

Regardless of the technology, the module market is developing in a specific direction: higher performance reached among other by using new technologies or a higher cell or module size. At the 'SNEC' in China in August 2020, 26 manufacturers were already showing modules with power classes greater than 500 and even up to 600 watts.

PES: Can you tell us what are the most common module sizes today and what implications do the growing sizes have?

CD: The development towards larger wafers and modules with higher performance classes as well as towards bifacial modules is obvious. Until 2010 the common wafer size was M0 (156 x 156 mm). This was followed by a standard size of M2 (156,75 x 156,75 mm) until 2018. From 2019 we mostly saw the M3 standard (158,75 x 158,75 mm). In 2021 the module sizes M6 (166 x 166 mm) and M10 (182 x 182 mm) gain market shares. The reason for the larger wafers is the goal of producing solar modules with higher outputs without having to develop new cell technologies.

However, this also results in new challenges for the subsequent module installation in terms of dimensions, bending rate and the release of clamps and brackets. This leads to significant restrictions, especially in the rooftop area and when using aerodynamic systems.

PES: Obviously mounting systems need to adapt to the new requirements. Before going into this, can you explain the different types of mounting scenarios and which factors need to be observed?

CD: When choosing the mounting method, the roof shape is the first decisive factor. In general, almost every roof is suitable for installing a PV system. Flat roofs, however, are most common for commercial

installations with larger systems.

The calculation of the load capacity is a particularly important step with this scenario. In addition to the components, any potential ballast that might come into play, such as wind or snow loads, must be taken into account. There are already some mounting systems on the market with low net weight and good aerodynamic properties that are particularly suitable for flat roofs.

To protect the membrane (foil and bitumen) an additional structural preservation mat is required. Systems in which the building protection mat is already integrated in the rails are a very good option for these scenarios. The pads should be distributed across the rails in such a way that an uninhibited drainage of water is guaranteed.

If the flat roof has thermal insulation, the load-bearing capacity of the insulation must be carefully checked in advance. In the case of older buildings, they often have insulation with a low compressive strength. In the case of new buildings, it depends on whether a PV system was already factored in the planning phase or not. In order to be able to better distribute the load of the solar system and potential environmental ballast, it makes sense to use a system with a wide contact area and wide rails. In the case of punctual loads, additional cost for load distribution must be factored in.

Systems with continuous profile rails distribute the load evenly on the roof. For example, we developed our 'IBC AeroFix' system in close contact with industry associations and manufacturers of insulation systems. The system does not damage the roof cladding and there is no risk of water ingress.

PES: So, weight and insulation factors are key for flat roofs. What criteria are most important for pitched roofs?

TB: While every roof has its own specific requirements an important factor for all cases is that the PV system needs to be securely fixed to the roof. The majority of roof types can be covered with standard mounting systems. In some cases, however, individual solutions are required as it is the case, for example, with roofs with metal roof tiles, a sheet of metal simulating several tiled tiles. In the case it is even more important than usual for roofers and solar installers to work closely together. It is important not to invalidate the roof manufacturer's warranty with a PV installation.

In order to guarantee a correct planning of the PV system, we provide our customers for example a planning tool, the so-called PV Manager. It is a comprehensive software program, offering a wide spectrum of functions for planning, selling and processing. The PV system is shown among others in a 3D animation and the software also supports with the static design.

PES: As pitched roofs are very common in the residential market, let's get back to the changing aesthetic requirements you mentioned earlier. Are there additional factors to the system colour

CD: Another factor for a pleasing visual appearance, more and more home-owners are favouring a closed module array. To achieve this without compromising the system efficiency, smart modules or microinverters can be used in shaded areas. These can be individually controlled. This way the module in the shaded areas will not negatively influence the capacity of all modules connected to a string, as it would be the case with normal modules.

PES: Are in-roof installations a growing trend?

CD: We currently see in-roof installation as a niche market. For our mounting systems we attach great importance to not damaging the roof membrane and not risking roof leaks. The in-roof installation is very complex and expensive, and the fitter must be very careful that the roof remains water-tight. In addition, roof-top systems also offer better cooling conditions.

We also have very high quality and efficiency standards for assembly solutions. To cover those, all modules and mounting systems we use are tested under very strict conditions in the SUNLAB PV test laboratory. This means that every module and every assembly system must achieve certain values and meet criteria in order to be included in our portfolio.

Current in-roof mounting systems do not yet achieve the quality and efficiency values that we have set. In this regard, at IBC SOLAR modules are not only tested individually, but also directly in combination with the mounting systems to assure they work well together in their applications. This is also the basis for warranties such as the of 15-year warranty on every combination of IBC SOLAR modules and IBC SOLAR mounting systems.

PES: Coming back to our original theory of mounting systems having to adapt to new requirements. We have talked about the specific needs for certain rooftop conditions, have touched on the overall growing esthetical demands and on the growing module sizes. Are there additional factors or connections between these topics influencing mounting systems?

CD: Yes indeed. Following the trend of growing module sizes, flexible mounting systems can offer a number of benefits. Not only can installers use the same system they are familiar with for different module sizes. The flexibility also allows to use different modules within one system.

We have taken the recent developments into account when developing our latest generation of mounting systems for flat roofs which can be used for modules with lengths from 1500 to 2100 mm and widths from 980 to 1150. With the new IBC AeroFix G3 it is also possible to combine wide and narrow floor rails in the same system. This way, more stable roof areas or modules with less ballast can be covered with the cheaper, narrow rail, which we call Eco rail. This not only ensures maximum flexibility, but also reduces the cost of materials and the overall costs of the system significantly. At the same time, the roof is securely equipped.

PES: Is the weight distribution is also a security related factor in addition to the flexibility?

CD: Yes, it's one important factor. A second is related to the mechanical stress which can damage cells and thereby reduce the performance. We have addressed this issue with an integrated tilting joint in the assembly support. This way the modules are mounted mechanically tension-free on the system.

The tilting options and system flexibility offer additional benefits. Modules can not only be mounted horizontally, but also upright and comes with more additional support options for the module frames. This way, breaking of the modules or pressing of the modules on the roof surface is prevented in many cases. With an elevation of 8, 10 or 15 degrees in a south or east-west direction, there are six different installation and orientation options.

PES: So we can conclude that the changing module size has quite an impact on stability, security and esthetic requirements. Thank you very much for these insights.

CD: It's been a pleasure, we are looking forward to the next market developments and to supporting exciting installations around the globe.

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