



Collaboration with sustainability at its core

PES had a great interview with Steve Davies, PV Market Manager at DuPont Teijin Films and Alessandro Anderlini, Business Manager responsible for the EMEA markets in Coveme's PV Solar and Specialty Films Divisions. This is a good example of suppliers and manufacturers collaborating to provide the best product for their clients. Sustainability is of paramount importance to both companies, which gives them a strong common ethos.

PES: Welcome to PES Steve and Alessandro. It is lovely to have both DuPont Teijin Films and Coveme taking part in the interview to give a well-rounded perspective. If we can begin with DuPont Teijin Films first of all; can you give us a brief introduction to the company for those who may not know?

Steve Davies: DuPont Teijin Films are one of the leading global suppliers of polyester films, supplying multiple markets and applications. We see the solar industry as strategic for our company and are the leading supplier of polyester film for front and backsheet applications.

There are over 50GW of installed capacity with backsheets using our Mylar® UVHPET™ products as the outer protective layer, and since launching these products in partnership with Coveme in 2008 we have not had a single reported field failure.

PES: And Alessandro, tell us a little bit about Coveme and what you do?

Alessandro Anderlini: Coveme is a world leading converter of PET films thanks to 60 years of experience in transforming this extraordinary material. We treat, coat, heat-stabilize, laminate and cut polyester film for a wide range of applications, from PV to biomedical, graphic and industrial print, microelectronics and automotive.

We have two production sites in Italy and China accounting for over 15GW capacity and three research and development laboratories, in Italy, China and Germany. With 20-year long experience in producing backsheets we managed to supply to the photovoltaic industry over 350 Mil sqm of backsheets and frontsheet without reporting any PV module failure.

PES: We would be interested to find out more about your range of clear UVHPET™ products for bi-facial modules if we may?



Steve Davies

Can you describe these in some detail for us?

SD: We have developed a range of clear products for PV applications including clear core layer films as well as UVHPET™ outer films with different levels of hydrolysis resistance and UV barrier depending on the requirements for the applications. We also offer the film in different thicknesses to cover 1000V and 1500V applications and to offer the flexibility to use one single layer of UVHPET™ or two layers for a clear PPE construction.

PES: These sound like something that could be challenging to develop, is that right?

SD: Developing a product for an application as demanding as the outer protective layer of a backsheet is never straightforward, but we already had some useful building blocks in place with our existing white and black UVHPET™ products as well as several decades of experience of supplying clear UV barrier films into equally challenging applications such as GRP and greenhouse screens.



Alessandro Anderlini

We are used to the challenges of providing the optimum mechanical properties for high speed and high temperature lamination processes with the required level of hydrolysis protection and UV barrier, but with clear we have an equally important target to achieve with very high levels of light transmission. We are confident that we have developed a range of films with the right properties to allow companies like Coveme to produce clear halogen free backsheets with the same confidence in performance that they have with our other UVHPET™ products.

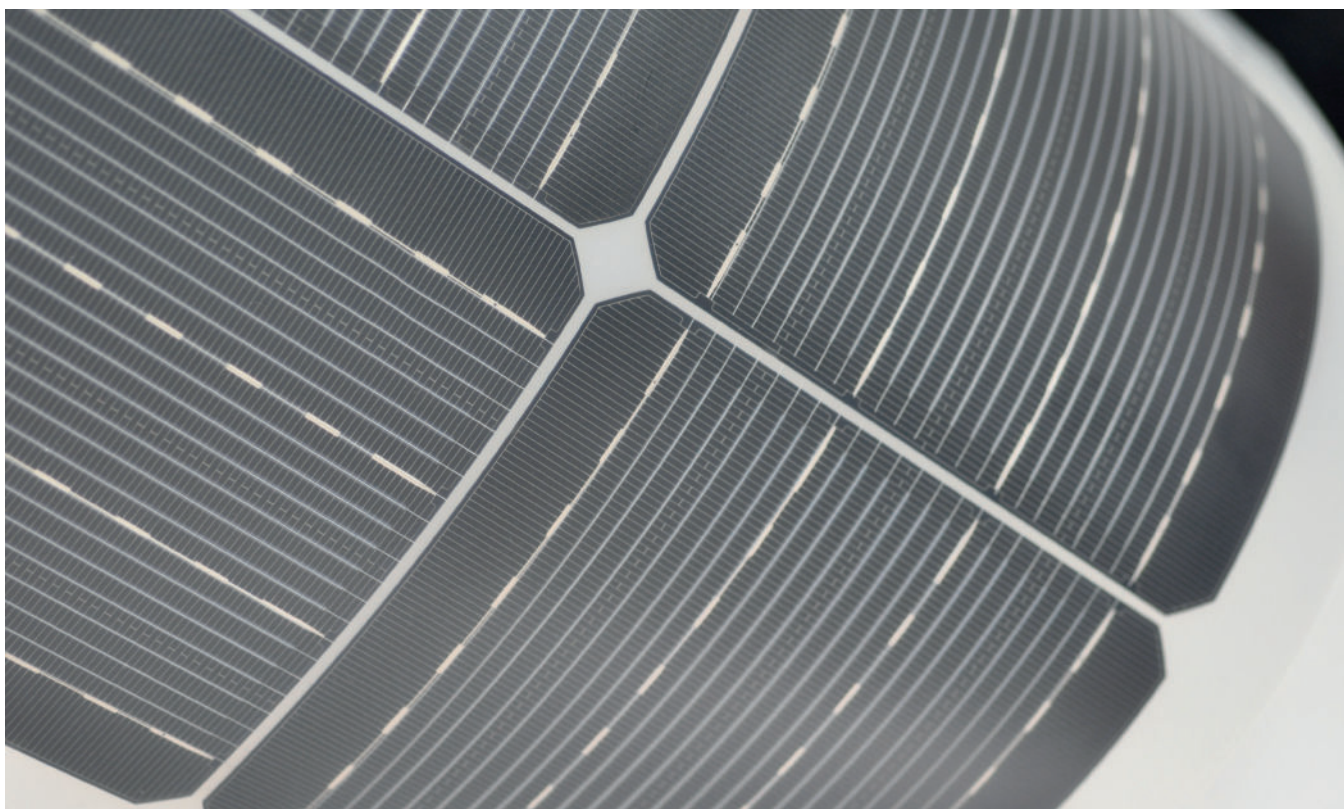
PES: What benefits do UVHPET™ based backsheets offer in the renewables sector?

SD: Mylar® UVHPET™ range has a lower carbon foot print compared to fluorinated alternatives or glass backsheets, and is halogen free which we believe is a significant benefit in terms of the overall sustainability of the module. Increasingly the negative impact on future recycling processes caused by hazardous material in modules is being focussed on as noted in the Fraunhofer 'end of life pathways for photovoltaic backsheets' report which concluded that the 'use of fluoropolymers or halogenated compounds should be avoided'.

We believe UVHPET™ based backsheets offer module manufacturers a more sustainable backsheets without compromising product performance, and have assessed our range of clear products to our full weathering protocol including IEC testing, sequential testing and perhaps most importantly our real life data from front sheet installations. We now have over 3 years of data of 100% exposure to full irradiance in Florida (correlating to 30 years of exposure as a backsheet if you assume a 10% albedo) with the data showing excellent retention of mechanical properties and minimal colour change over that period.

PES: Turning to Coveme now if we may; from a customer point of view, what are the reasons for producing UVHPET™ based backsheets over alternative solutions?





What do you see as the main benefits of this particular product?

AA: Mylar® UVHPET™ is a key component of our dyMat® PYE polyester based range of backsheets with has proved over the last 13 years to be a valid alternative to fluorinated based backsheet, bringing high UV and hydrolysis resistance features, coupled with the intrinsic characteristics of PET films: recyclability and much lower impact in CFP.

dyMat® PYE backsheet has also been extensively tested and stressed over the years, by TIER 1 PV producers and independent labs, showing excellent reliance and consistent quality being employed in various PV module applications, from rooftop to BIPV to ground installations and in different climates from high humidity to hot and dry areas.

PES: Halogen-free backsheets are an alternative to glass and fluorinated materials, what makes these a better choice in terms of their benefits?

AA: First of all the use glass/transparent backsheets instead of glass/glass in a PV bifacial module provides a number of advantages like: notable reduction in the weight of the module with a consequent reduction in transport and installation costs, improved productivity of the module itself for the same cost, less fractures of the cells during production, exceptional thermal conductivity reducing the operating temperature of the NOCT module and the use of the standard ALU frame which reduce the cost of the BOS for the assembly system.

Furthermore, using Halogen-free backsheets instead of fluorinated material reduce the number of hazardous materials in PV modules, offer a significantly lower carbon foot print, reduce end-of-life waste-to-energy incineration costs and enable closed loop recycling of both industrial as well as post-consumer waste.

PES: What innovations do Coveme's clear backsheets offer that make them stand out from competitor products?

AA: Coveme has designed, developed and marketed innovative new solutions to make polymer films the best option for protecting not just the back part (backsheet), but also the front part: frontsheet, of the new generation panels. These flexible ultralights can be installed on roofs with limited load capacity, or used for new integrated solutions (BIPV) and those compatible with thin film technologies (CIGS, OPV).

Thanks to a recent investment in a new production line equipped with cutting-edge UV coating technology, Coveme is able to improve the film resistance to UV rays, abrasion and scratching thus ensuring the guaranteed performance is achieved.

Also, this new type of innovative coating enables the coating itself to act as an anti-reflective surface and to increase the amount of light that reaches the cells with low angles of incidence. These new materials have been tested and validated internally using international standards. The tests include resistance to abrasion and resistance to scratching to guarantee long life.

PES: Can you give us an example of how you have used the product in a project?

AA: Our transparent backsheets have been employed in three PV module installation fields in USA dated back to 2015 in what was one of very first bifacial module installations of glass/backsheet PV modules. These installations feature a transitional humid subtropical climate (Cfa), with very hot, long and humid summers and mild to cool winters.

The inspection made in 2018, after 3 years in service field, revealed that PV panels were working in optimum conditions without showing any signs of yellowing, cracking, chalking or bubbles. The PV modules are, as per today, after 6 years of operation, running fine without any sign of degradation or failure.

In regards to frontsheet our materials are being employed in several applications including Automotive and Nautical semi-flexible PV modules since more than 10 years without recording any particular damage or extreme power drop.

As evidence the CA above assumption it is worth to mention a Polymer vs Glass comparison analysis made by a PV module producer of flexible panels in ITALY. The test started in 2013 and lasted 5 years using 4 different PV panels, 3 standards made of glass/backsheet and 1 flexible made out of Coveme frontsheet and backsheet. The energy production was measured along the years and the flexible PV panel was showing a similar performance, in one case even better than standard PV modules. However, the

most interesting part was that standard PV panels glass/backsheet designed to work for 25 years presented a faster degradation compare to a flexible PV module using polymers in front and back.

PES: What changes are you both seeing in terms of new technology coming through that might be of benefit?

AA: I think we both agree on this. New cell technologies are coming through like HJT, Perovskite and OPV cells. These are requiring backsheet and front sheets with different degrees of moisture barrier. For this reason, we have already started expanding our product portfolio, which already includes aluminium based backsheet, with new products designed to provide several features according to the WVTR level required.

SD: I agree with Alessandro about the fast evolving flexible PV technologies which have driven our involvement in R&D projects aimed at enabling cost effective ultra high barrier layers to provide protection in sensitive applications such as CIGS and OPV modules. These projects have focussed on the development of PET films with ultra clean and smooth surfaces for the deposition of mono layer barrier materials, and the performance has been proven at semi-industrial scale to deliver the barrier properties required for even the most sensitive flexible PV technology.

PES: To sum up, how important is the issue of sustainability to DuPont Teijin Films and Coveme, and have you any predictions for how this might develop further still in the future?



SD: At DuPont Teijin Films we are increasingly seeing sustainability as central to our future business, and believe that the combination of our heritage, scientific excellence and a focus on sustainability will enable us to develop future products that deliver positively to the environment and the communities we serve.

Specifically in relation to PV, I expect a significant and increasing focus on the challenge of future PV waste and believe there will be a drive to reduce the use of materials which represent an economic, technical or safety barrier to future recycling processes.

AA: At Coveme sustainability is the core of our company goals to constantly improve behaviours, processes and products from treatment and cleaning of harmful fumes and water to self-powering production lines, from differentiation and recycling of production waste to differentiation and recycling of office waste, from a new product range made with recycled PET to EoL and LCA assessment and certification of products and processes.

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