

HONEYWELL JET APPLIED BRAZING FLUX ENABLES TYLL SOLAR TO IMPROVE HYBRID SOLAR PANEL EFFICIENCY

Tyll Solar produces lighter, more energy-efficient PV-Ts by applying Honeywell manufacturing process know-how

Case Study

JAY FISCHER, FOUNDER AND CEO, TYLL SOLAR:

“When we could no longer effectively join together our channel plates using traditional techniques, Honeywell suggested we try its innovative Jet Applied Brazing Flux technology. Despite the COVID headwinds, we successfully adapted the technology to our production process. The result? Lightweight, long-lasting aluminum channel plates. In addition, we benefitted from excellent Honeywell support.”

Honeywell

OVERVIEW

When Tyll Solar, a US-based R&D company, wanted innovative solar modules to improve the efficiency of its hybrid photovoltaic-thermal solar collectors (PV-T), it enlisted support from Honeywell. Honeywell suggested applying its jetflux* printing technology to the production of the large, 1m x 2m channel cooling plates installed in a single piece behind its 350W solar photovoltaic modules. This enabled Tyll Solar to increase the power efficiency and solar collection capabilities of the panels.

BACKGROUND

Molten filler metal does not naturally wet an oxide film, and as such, the most important step in aluminum brazing is the disruption of the surface oxide. This is achieved by the application of flux, which melts below the melting point of filler metal. During brazing, molten flux facilitates the wetting, spreading and flowing of molten filler metal into the gap between two parts, forming a brazed joint.

This widely employed technique uses a spray, dip or shower process to apply flux uniformly to the surface of a part. However, it also results in the excess use of flux, which is not only wasteful, but can contaminate coolant flow channels where no joints are required, leading to corrosion and reducing the lifespan of the panel.

SOLUTION

In response to Tyll Solar's desire for lighter, longer-lasting PV-T panels – and to mitigate the contamination inherent in the traditional application of flux – Honeywell suggested incorporating its jetflux technology into Tyll Solar's paint robot.

Reflecting 25 years' experience providing solutions to the aluminum brazing industry, Honeywell jetflux is a thixotropic paste incorporating flux particles several times smaller than the diameter of a human hair – particles that would normally be too small to be used safely with powdered flux. The technology prevents hard sediments



PV modules in a test installation from Tyll Solar in Rochester

QUICK FACTS

Honeywell Solution

Jet printing technology using jetflux for controlled atmosphere brazing of aluminum

- Over 5x energy (power + heat) harvested from same footprint as a standard PV
- Improved lifecycle costs

Customer Results

- Large 1m x 2m channel cooling plate for installation in one piece behind a 350W PV-T module
- Reduced roof weight due to formed, lightweight aluminum construction

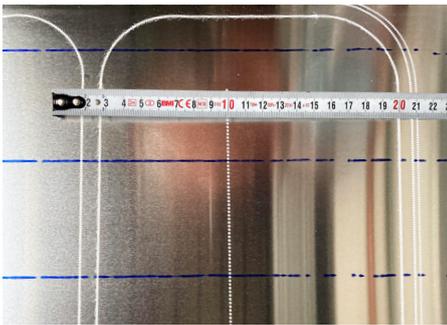
Customer

Name: Tyll Solar
Location: Rochester, USA
Industry: Renewable Energy
Website: www.tyllsolar.com

* patent pending



Channel plate produced with our jetflux braze material.



Channel plate after jetfluxing with the dotted white line consisting of the dry jetflux.



Channel plate after brazing

from forming in process equipment and from blocking jet nozzles. The particles have an extremely low melting onset, giving them more time to react to and disrupt the oxide and thus promote brazed joint formation.

With its 2 x 2m reach and repeatability of 0.3 mm, the robot's jet printing head deposits jetflux dots on the outside of the flow channel. The accuracy ensures that the channel stays clean, preventing interaction with the coolant and corrosion. Moreover, the process improves the durability and lifespan of the PV-T.

Furthermore, real time control of the deposition pattern prevents overspray and enables the flux to be applied to both uneven and formed surfaces and to different orientations. Using jetflux, flux can even be applied from the bottom upwards.

BENEFITS

Through the adoption of Honeywell Jet Applied Brazing Flux technology, Tyll Solar has realized a spectrum of benefits.

Jay Fischer, founder and CEO of Tyll Solar, said: "Honeywell addressed the critical issues of reliability, weight, and cost effectiveness of the thermal component of our PV-T module. The jetflux system allows very high speed and accurate flux application, minimizes the amount of flux used, increases reliability and reduces cost and weight. Through Honeywell's expertise, we've met our engineering and cost targets."

"In addition, the reliable, cost-effective and lightweight structure enabled by jetflux allows us to offer our customers a product that's actually greener than PV, provides more electricity and valuable heat, and further reduces greenhouse emissions, according to the New York State Pollution Prevention Institute."

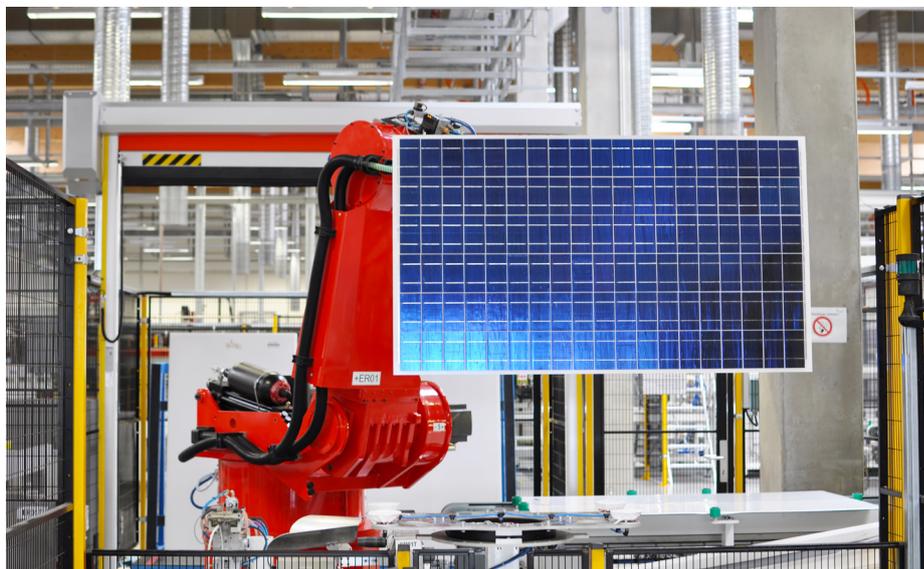
Fischer concluded: "We're confident that, as our product and company evolves, we have a robust and flexible manufacturing platform with the Honeywell Jet Applied Brazing Flux system."

NEW APPLICATION POSSIBLE	JET THE FLUX TO APPLY IT TO TYLL SOLAR'S DESIGN
Reduce flux load and residue	Coating weights can be controlled digitally and increased at critical locations
Fast drying	Low water content and heated printing head allows near-instant drying
No overspray	High deposition accuracy
Fluxing in all orientations	Fluxing complex heat exchanger designs possible
Environmental sustainability	<ul style="list-style-type: none"> • Less waste • Less flux required for production • Reduced F emissions • Reduced CO emissions

CONCLUSION

PV-T modules are designed to generate power and heat at the same time, maximizing the energy harvested from limited roof space and minimizing greenhouse gas emissions. Honeywell Jet Applied Brazing Flux technology has enabled Tyll Solar to partially flux and braze its aluminum channel plates for the first time, reducing roof weight, increasing durability and reducing lifecycle costs.

Beyond the success of this test case, there is a market opportunity for jetflux technology in a wide range of applications, from heaters and radiators for air conditioning where jetflux can enable complex formed designs to powertrain cooling components in electrical vehicles, where large base cooling plates or light channeling fins enable active thermal management of battery packs. Only when optimally cooled do EV batteries operate with



The picture shows the assembly process of solar panels

high efficiency and provide the highest possible drive range and longest life.

Please contact Honeywell to explore additional Jet Applied Brazing Flux applications.



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For more information

To learn more about Honeywell

Jet Applied Brazing Flux, please visit:

<https://advancedmaterials.honeywell.com/us/en/contact-us/sales-inquiry/>

[fine-chemicals](#) or contact your

finechemcustomerservice@honeywell.com

Honeywell Fine Chemicals

Wunstorfer Street 40

30926 Seelze, Germany

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