

WHAT'S GOING ON IN...



Bringing Innovation to Prefabricated Construction with polyurethane insulated metal panels

Javier Dominguez, Associate Professor Engineering & Architecture University of Zaragoza, Spain
 Javier Carnicer, Global TS&D Director at Dow



Javier Domínguez Hernández, Associate Professor Engineering & Architecture, University of Zaragoza, Spain. Registered architect and engineer. Javier started his career, working from 1988 -1990 and 1994 -1995, as Director of Research and Development in Pikolín, S.A., a bedding industry located in Zaragoza, Spain. From 1991 - 1992 he was assistant professor in the field of Theory of Structures. In 1995, he was appointed to a tenured associate professor position in the area of Construction Engineering, both belonging to the department of Mechanical Engineering at the College of Engineering and Architecture where since 2013 he holds the Head of Department. Javier was born in Zaragoza, Spain, in 1963. He holds Bs. Ind. Eng., Ms. Mech. Eng. and Ph.D. degrees from the University of Zaragoza and a Ms. Arch. degree from the University of Houston (Texas).



Javier Carnicer, Global TS&D Director at Dow Polyurethanes and ce|de|pa Director. Javier Carnicer is representing ce|de|pa, Dow's and SAIP's global panel development center with a state-of-the-art and industrial-scale line fully devoted to testing and prototyping, located in Tudela, Spain. The center was founded by Dow and SAIP in 2011 to bring sandwich panel technology and innovation to market. Javier has been working for Dow since 1987 and currently hold the role of a global TS&D Director at Dow Polyurethanes and is located Spain. Javier was also the President of IPUR, Spanish Rigid Polyurethane Industry Association from 2008 - 2012 and he is now the President of ANDIMAT, Spanish Association of Insulation materials. Javier was born in Zaragoza, Spain, in 1962. He earned a master's degree in chemistry from the University of Zaragoza.

For those who didn't attend the **UTECH Europe 2015 Conference**, we report hereinafter the main contents shown by our two valued speakers.

Enjoy your reading!

The value of prefabrication and trends in construction

Javier Domínguez, Associate Professor Engineering & Architecture at the University of Zaragoza, Spain

All the technical, technological and scientific advances that have allowed the humanity to gradually improve the citizens welfare, have not been applied in the same way to the construction industry.

Construction, particularly of residential buildings, continues using traditional processes, fundamentally artisanal procedures.

The artisanal crafting of products (such as a woman knitting a scarf) is considered as an unusual, inefficient and uncompetitive activity in our technological society. Nevertheless, placing bricks for making a wall or closing a façade is a common practice in the construction industry.



Both are artisanal processes, being the latest admitted and non admitted the former.

Since traditional construction processes have been able to satisfy all the perceived needs in buildings, these processes have not experienced a technical evolution that provides actual competitive advantages for the final user.

An industrial product is always imposed to the craft ones when it is able to meet all human needs more efficiently. Then, what is the reason why industrial construction processes do not meet the residential construction needs?



Nowadays building design is based on singular architectural solutions, usually valid for a single project and without the objective of being replicated. They are mostly thought and directed by people with artistic preparation.

Even the so called “High Tech” buildings are just based on more advanced materials, but assembled in artisanal ways.

Therefore, they should be denominated “High Craft” buildings. Many buildings parts and pieces have to be ordered and singularized for every particular building, while in an industrial process (even for making a singular product), standardized parts are used and assembled.

The technical world tends to a general quantitative analysis and maybe a subjective, qualitative approach introducing concepts with a difficult scientific approach it is needed. One of these concepts might be habitability, in the sense that industrialized construction needs an inhabitable approach.

There have been quite a number of prefabrication initiatives that have been successful from the technical point of view but after a few years they have been abandoned, falling into disrepair due to its deficiencies for living. The current state of the Nakagin Capsule Tower of Tokyo, Japan is a good example of this situation (see pictures below).



A residential building requires more than a succession of technical qualities. The needs are totally different, to mention home feeling, cultural acceptance and integration with the surroundings.

Industrialized products have not been able to incorporate these considerations: singularity, habitability and all previous subjective issues. In the residential scope, the technical advantages by themselves do not impress consumers. For that reason, penetration of industrial prefabricated processes is higher in industrial buildings, where all these subjective requirements are less decisive.

The challenge to dominate the market is designing industrialized products for construction which integrate all these needs of the residential sector.

The prefabrication market can provide all the technical qualities but has to undergo a thorough research to incorporate the singularity, habitability and subjective issues associated to the human requirements.

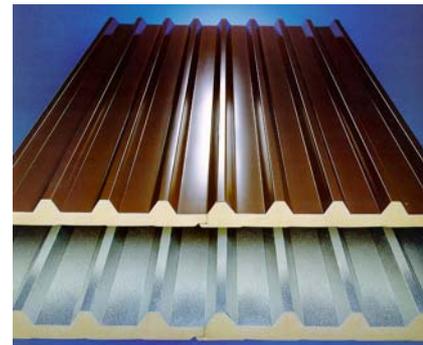


Human needs: singularity, habitability, subjective issues, satisfaction

The Role of Insulated Metal panels (IMP)

Within all the prefabrication products existing in the industry, **Insulated Metal panels (IMP)** have and are playing a key role:

- **IMP offer great functionalities** (energy efficiency, durability, lightness, structural resistance, etc.) and are highly accepted for industrial construction based on these technical functionalities.
- **IMP are very good solutions both for roof and wall**, allowing more efficient and faster building construction than traditional methods, saving installation costs, and increasing safety.
- **Higher industrial quality** makes it easier also for execution, and the quality standard reduces errors and improper installation, combined with the fact that they are normally installed by more specialized workers.



To achieve the objective of diversifying and enlarging the IMP applications in the residential construction industry, only the innovative development centers driven by leading companies can play a key role:

the Development Center for Continuous Panels **ce|de|pa** constitutes a pioneer initiative for the technical innovation of insulated metal panel solutions (IMP), by combining the best technical features, a comprehensive and integrated treatment of the residential sector needs and the collaboration with the best research teams.

How the global panel development center ce|de|pa helps to accelerate innovation

Javier Carnicer, Global TS&D Director at Dow

As prof. Dominguez has explained, the challenge and opportunity for PU Insulated Metal Panels to grow into construction, more in particular into residential construction, is not only the ability to generate superior technical solutions, but also to providing solutions which satisfy “human needs”.

What is ce|de|pa?

Dow and **SAIP** have established a unique development center for sandwich panel manufacturers to develop polyurethane formulations and application solutions for the construction market.

ce|de|pa was created to integrate multidisciplinary skills and competencies, making it possible to innovate into new products, processes and panel solutions.

In the way it was created, it also opens the doors for collaboration with the best research teams.

ce|de|pa as a toolbox to enable for innovation, offers the possibility to work on different processes (see box on the right), with the possibility to enhance it, depending on the innovation opportunities.

Full industrial continuous lamination line for:

- ✓ Insulated metal panels roof
- ✓ Insulated metal panels wall
- ✓ Doors
- ✓ Insulated flexible faced panels
- ✓ Composite and multi-functional panels
- ✓ Glueing
- ✓ Combi panels
e.g. steel // flex-faced
- ✓ Fire wall equipment

The Value of ce|de|pa

ce|de|pa generates value by :

- supporting innovation development globally;
- mitigating risk for new projects, as it allows to eliminate most of the uncertainties associated with any new venture, that has a particular value for emerging markets and new customers to PU;
- accelerating new lines commercialization, shortening time to certify products, reducing learning curve and assuring smooth start-up are some of the ways.



ce|de|pa allows Dow to innovate on the chemistry/the PU formulations and SAIP to innovate on the process. Both together to innovate on the product and ultimately, the customers to manufacture superior products than the existing ones.

How does ce|de|pa help to accelerate innovation into construction markets?

In established economies, construction companies have to adapt to ever changing industry influences in order to stay competitive:

- Green schemes
- Changing norms and regulations
- Changing standards for energy efficiency

It is not a secret for any of us, all the different trends and changes affecting our industry and the accelerating pace, making it more and more difficult to adapt, and to cope with new needs.

Accelerating new developments is now more strategic than ever.

ce|de|pa can help to keep pace with these developments.

In its short life ce|de|pa has already contributed to accelerate innovation by developing, prototyping, testing panels or innovating on the panel production process.

Good examples are :

- New halogen free PIR solution VORATHERM CN 100 presented by Dow at UTECH EUROPE 2015
- SAIP new multi components dosing machines
- Certification of panels before starting new productions, including Fire Performance Tests with external lab through special agreements
- Training to operators before new line start-up
- Production of pre-series and pre-marketing for new panel production

In summary: acceleration of new projects and mitigation of risks.

How does ce|de|pa help to reduce the start-up costs of a production line?

Customers benefit from ce|de|pa helping to reduce the startup cost of a new production line by:

1. **Training the operators** directly in ce|de|pa before installing the line: learning by doing flanked by experts while they experiment practically how to manage critical phases safely and be confident along the whole production process. Definitely ce|de|pa shortens their learning curve and mitigate risks.

In the way it is structured, ce|de|pa enables collaboration with Universities and Technology centers as innovation powerhouses

2. **Testing new equipment** in advance: thanks to the presence of an industrial scale line, new equipment can be verified and tested up to their maximum so that performance and limits are absolutely enlightened, reducing any potential issue of the starting phase.

3. **Testing new formulations** in advance for a smooth and cost effective introduction of new formulations at the customer, also from certification point of view ce|de|pa allows the customer a head start for new panels before actually producing them on site.

Thanks to these features, ce|de|pa helps to mitigate the risk of the investment.



A few more examples where this Dow and SAIP development center has had a very important contribution:

Dow latest innovation, the new halogen-free PIR solution VORATHERM™ CN 100 series, that was fully tested and trialed in ce|de|pa including Bs1d0 certification, providing a more sustainable halogen free insulation and achieving top euroclass fire reaction.



More Sustainable Halogen-free Insulation



Enables Top Euroclass Fire Reaction up to Bs-1,d0

What are panel producers saying about ce|de|pa?

Customers from all over the world visit ce|de|pa to testing SAIP's unique panel development line:

Quoting Mr Francesco Manni, Ceo at Gruppo MANNI SpA in Italy "a tool like ce|de|pa allows operators like us to move forward by testing the limits of new technologies to achieve top results".

Or JCS PANEX group from Georgia that could observe how a continuous production line works and experienced the opportunities and support offered by ce|de|pa before investing in their new line.

Or a leading board producer in China that had its crew trained in ce|de|pa in advance optimizing the investment.



Conclusions:

While other technologies has evolved, residential construction remains fundamentally artisanal and based on traditional processes.

Designing industrial products for subjective needs, is the challenge to dominate residential construction markets. Deploying insulated metal panel technology and industry innovation can enable to foster the evolution in prefabricated industrial construction.

ce|de|pa the unique panel development center owned by **SAIP** and **DOW** can be used by the industry to fully develop, prototype and test panel solutions, innovating on the product and production process to achieve the desired objective.

TEST AND DEVELOP INNOVATION @

ce|de|pa

www.cedepa.org

About SAIP Equipment - SAIP is an equipment designer and manufacturer for the polyurethane industry driven by innovation and quality. SAIP is committed to developing innovative solutions for the sustainable success and growth of its customers. Established in 1978 and headquartered in Inverigo (Como, Italy) SAIP leverages a network of commercial branches and affiliated companies around the world. Over the years SAIP has developed various kinds of technologies according to different applications such as the CONTITECH, continuous production lines for sandwich panels; the DITECH, discontinuous production lines for sandwich panels; the REFTECH, complete foaming lines for the refrigeration industry; the PIPETECH, continuous pouring and discontinuous spray solutions for pipelines; the SAIPTECH, customized and turnkey solutions for any technical application of polyurethane, epoxy and silicone resins. SAIP range includes also competitive and state-of-the-art, high and low pressure foam dispensing machines, elastomers casting systems and much more. SAIP provides its customers with the highest level of project-team specialization and with exclusive technical assistance focused on their needs, ensuring continuity in business relationships.

More information at: www.saipequipment.it

About Dow - Dow (NYSE: DOW) combines the power of science and technology to passionately innovate what is essential to human progress. The Company is driving innovations that extract value from the intersection of chemical, physical and biological sciences to help address many of the world's most challenging problems such as the need for clean water, clean energy generation and conservation, and increasing agricultural productivity. Dow's integrated, market-driven, industry-leading portfolio of specialty chemical, advanced materials, agrosiences and plastics businesses delivers a broad range of technology-based products and solutions to customers in approximately 180 countries and in high-growth sectors such as packaging, electronics, water, coatings and agriculture. In 2014, Dow had annual sales of more than \$58 billion and employed approximately 53,000 people worldwide. The Company's more than 6,000 products are manufactured at 201 sites in 35 countries across the globe. References to "Dow" or the "Company" mean The Dow Chemical Company and its consolidated subsidiaries unless otherwise expressly noted. **More information about Dow can be found at www.dow.com.**

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