

VICORPAN



LIFE VICORPAN – LIFE20 CCM/IT/001644 Project



*VACUUM improved INSULATION by CORE shaped
PANELS for refrigerators*



The LIFE-VICORPAN Project at a glance

THE PROJECT

VICORPAN

LIFE-VICORPAN Project aims at improving the thermal insulation efficiency of commercial refrigerators by using eco-friendly Vacuum Insulation Panels (VIPs)

THE TEAM



Epta Italy & Epta France

Basf Polyurethanes

Cannon Afros

THE LIFE-EU PROGRAMME



LIFE Programme is the EU's co-funding instrument for environment and climate action.

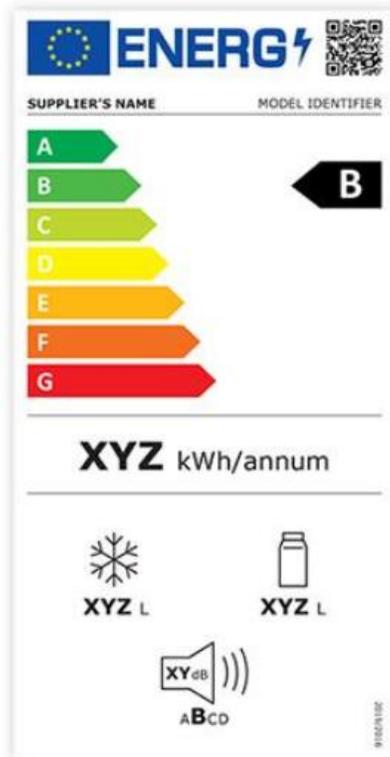
Discover more on:

cinea.ec.europa.eu/programmes/life_en

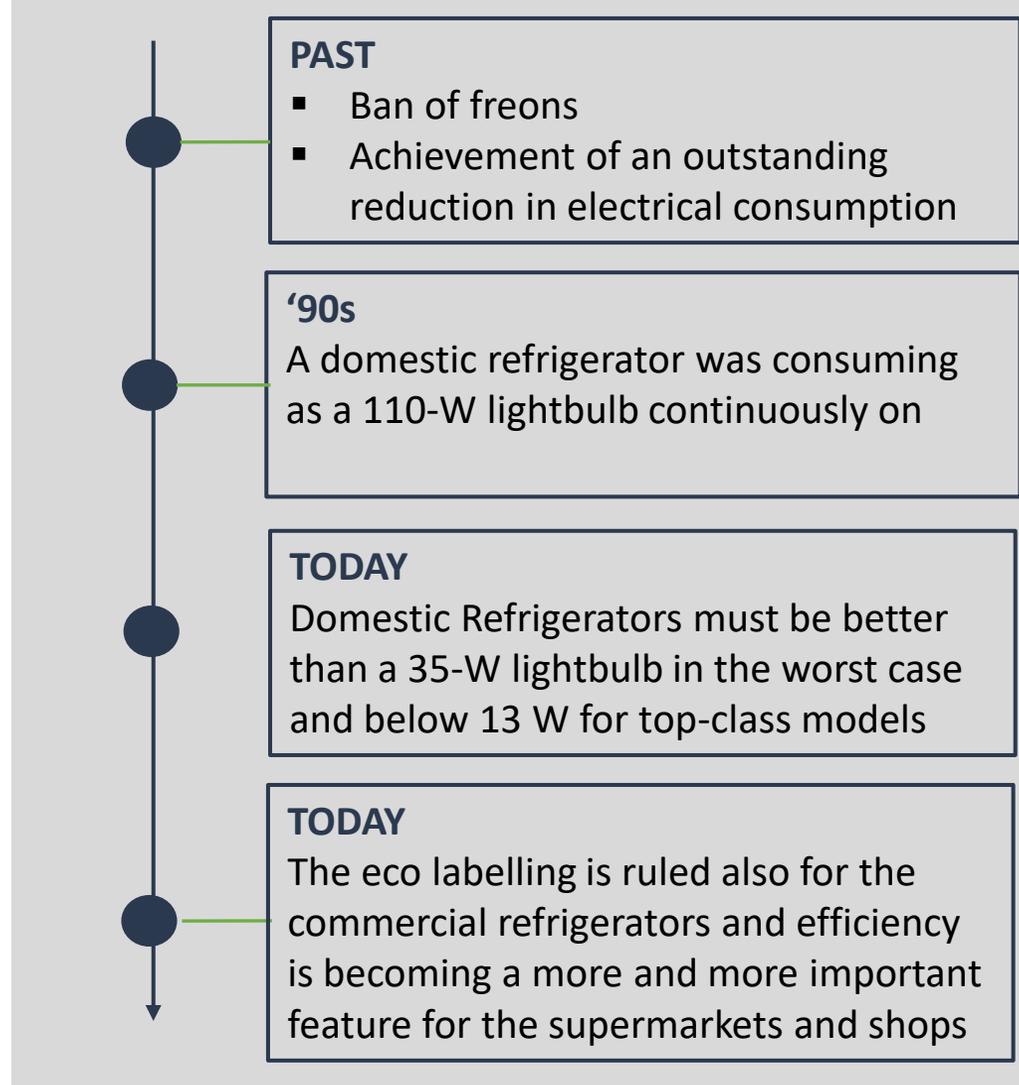
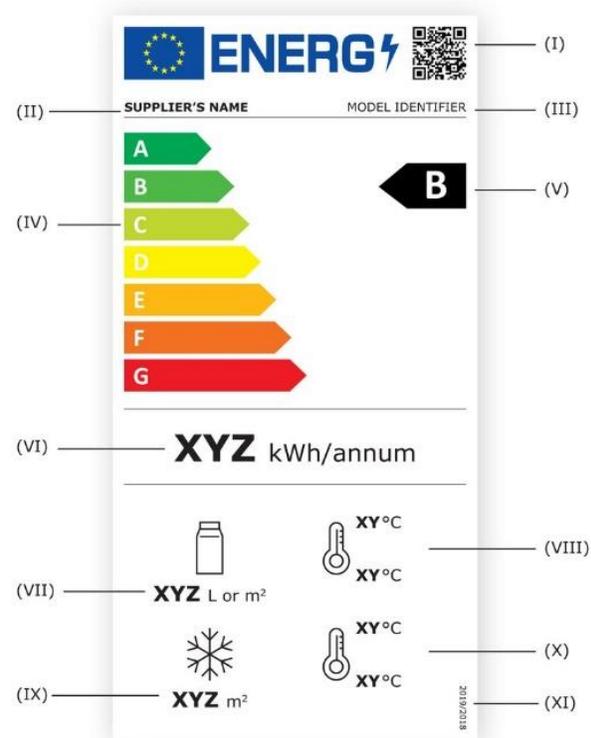


VICORPAN: Rules and labelling for energy savings

LABEL FOR DOMESTIC APPLIANCES, new classes



LABEL FOR REFRIGERATING APPLIANCES WITH A DIRECT SALES FUNCTION

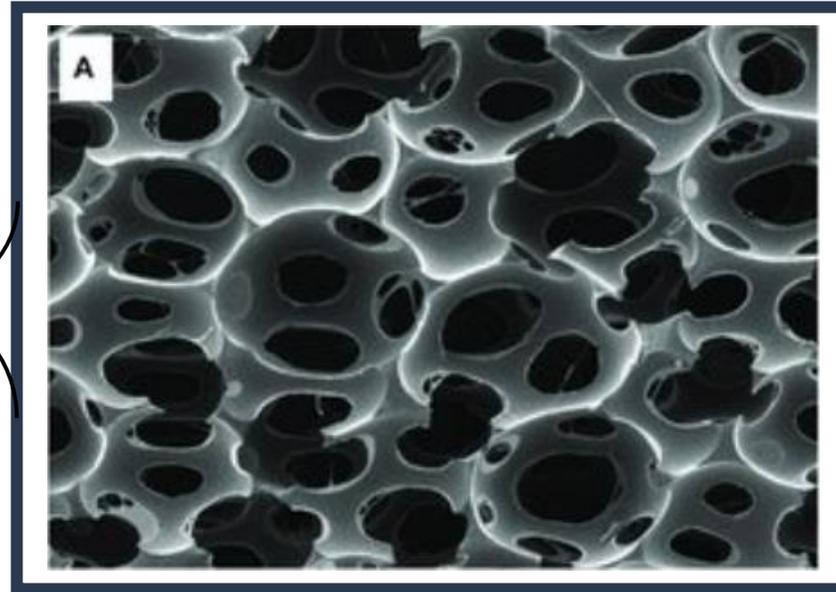


VICORPAN: Vacuum Insulated Panels

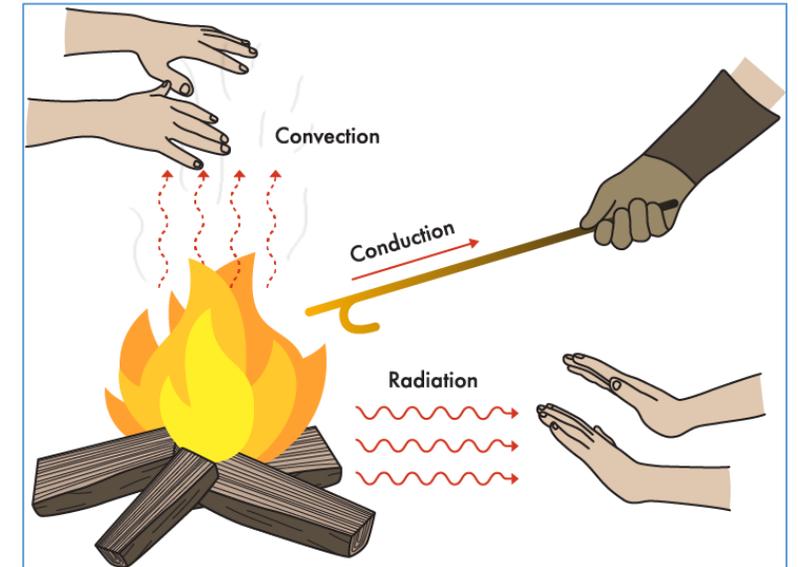
In insulation materials, heat is transmitted in 3 ways:

P.U.:
small cells +
thin membranes +
gases trapped inside =

excellent insulation
material



Pierced membranes:
gases can be taken out
achieving the 30% of PU
usual conductivity



CELL GAS	70%
PU MATRIX	30%

CONDUCTION	85%
RADIATION	15%
CONVECTION	0%



VICORPAN: trials with different bio based porous materials



Core Material	Achieved lambda value [mW/m/K]	Core density [Kg/m3]
Rice-husk ash	72.30	833.3
Rice straw	47.34	48.5
Sheep wool	11.44	266.6
Ground PU waste	7.52	250.0
BASF open-cell rigid foam	6.81	56.8



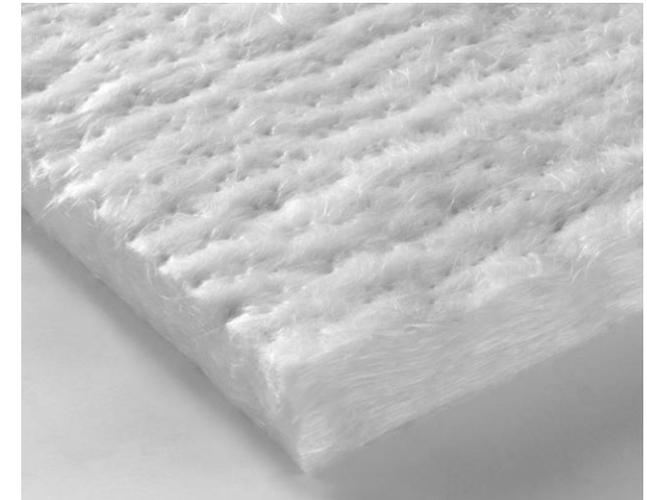
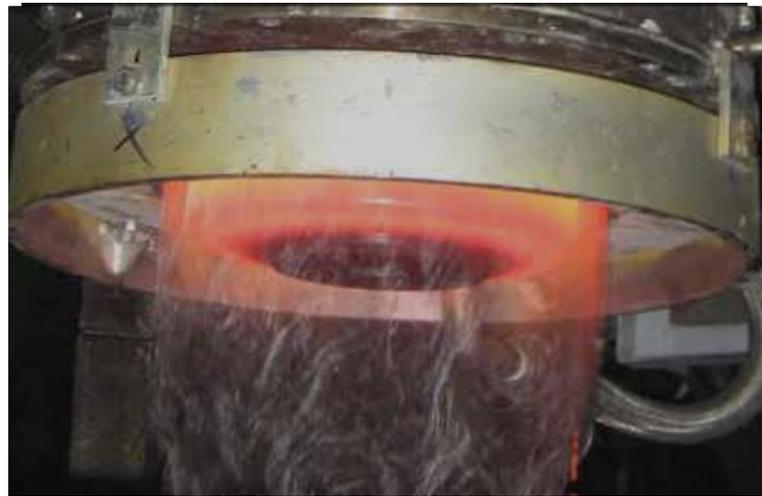
VICORPAN: the Vacuum Insulated Panels world

The most used and diffused types of VIP panels are based on cores in very thin glass fiber or fumed silica.

Glass fiber lasts 7-10 years, it is used mainly in domestic and commercial refrigerators.

Fumed silica is used mainly for Buildings and lasts 25 -30 years

P.U. based cores are much lighter and maintain the insulation properties for 7-8 years

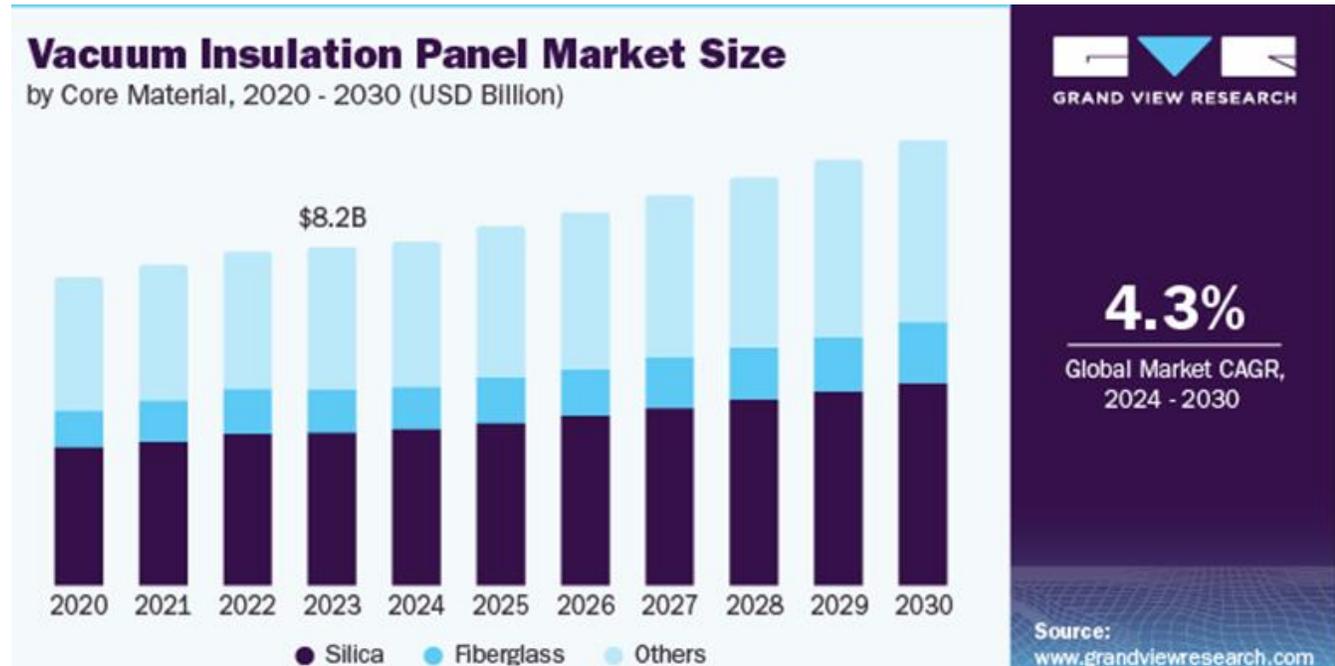


VICORPAN: the Vacuum Insulated Panels world

The VIPs exist from long time and the first industrial applications started around 25 years ago with some start up.

In this time lapsing its use as high performing insulator grew constantly and today it is around 8,5 Billion USD globally.

The main consuming area is Asia pacific with about the 45% of the total market



VICORPAN: VIPS with core in p.u. open cells foam

The Life Vicorpan Project aim is to develop and diffuse

VIP panels with foam cores in p.u., 100% open cells

Reduction 70% of the thermal conduction.

Lightness (56 – 60 g/lit)

Not release fine glass particles ($\geq 5 \mu\text{m}$)

End-of-life refrigerators can be recycled as the actual ones

Know-how and solutions gave rise to two new patents

VICORPAN

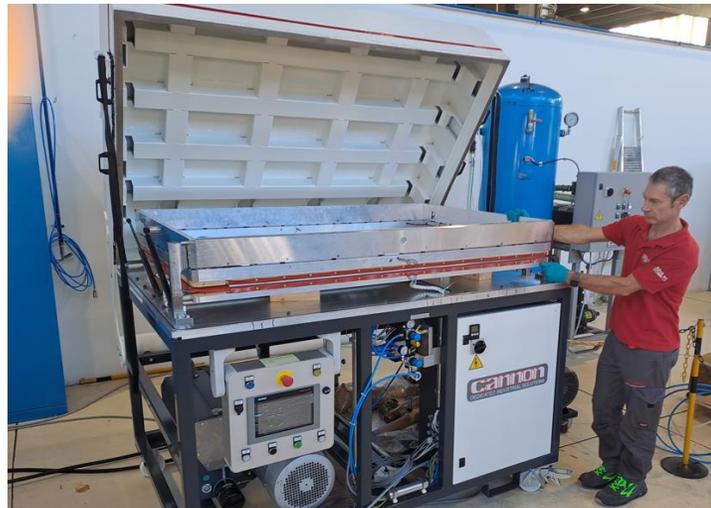
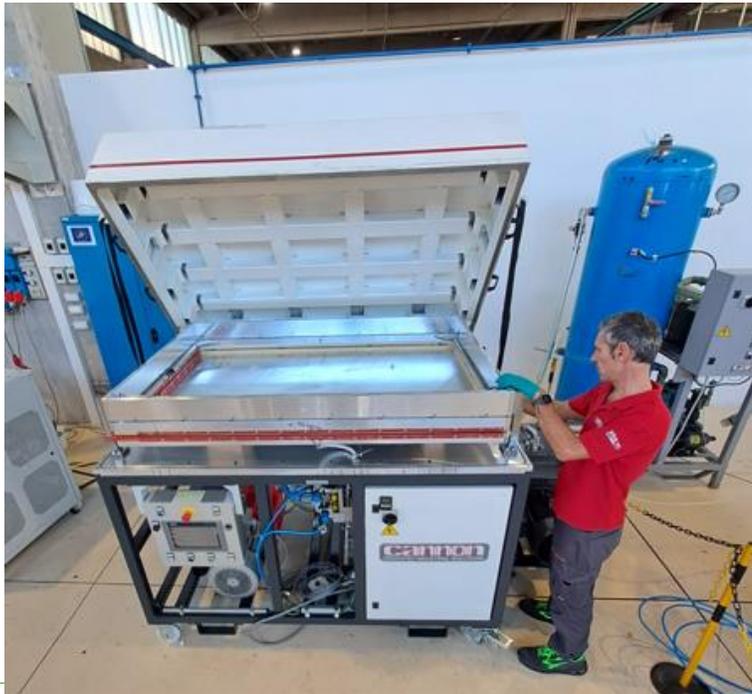


VICORPAN: Production of flat and folded VIPs



VICORPAN: evolution of the prototype plant the wide vacuum chamber

A wide size vacuum chamber requested a proper set up for sealing as well as a proper selection of the vacuum pumps. It permitted to produce the panels for the EPTA refrigerators



VICORPAN: prototypes production c/o Epta Italy

Application of the VIP panels and filling the remnant spaces of the cavity with foam.

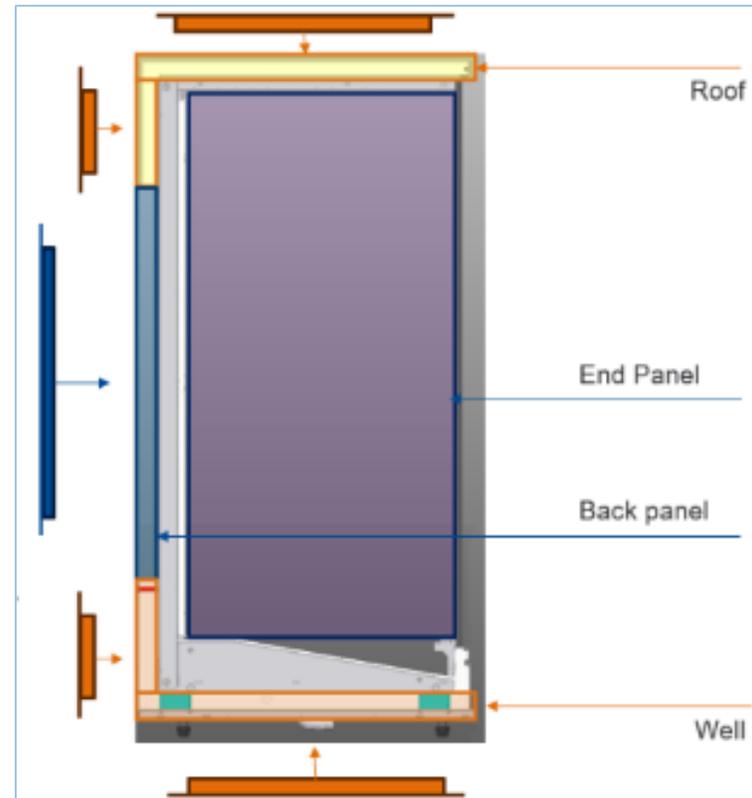
Results very positive, the VIP panels cover without problems the entire structure of the refrigerators

The panels, applied to the internal walls, give the best insulation capability thanks to the reduced temperature in contact with the cool side of the walls



VICORPAN: testing a vertical refrigerator c/o Epta France

EPTA France focused on a **Vertical Cabinet** model, configured with 3 parallel transparent doors and a common metal structure composed by 5 specific parts.



The test conditions decided by EPTA France was characterized by a smart procedure.

It permitted to compare directly consumption and efficiency of a standard cabinet with the contribution of each single wall insulated with VIP panels



VICORPAN: the Project of a refrigerator “FULL VIP” by Electrolux

Electrolux was one of the first stakeholders showing interest for the Vicorpan Project. The team of the Food Preservation Technology followed the evolution of the Vicorpan Project from the first phases .

They proposed internally to overcome the usual approach of inserting VIP panels and completing the structure with expanded foam by replacing completely the walls with polyurethane-based VIP panels



VICORPAN: the Project of a refrigerator “FULL VIP” in Electrolux

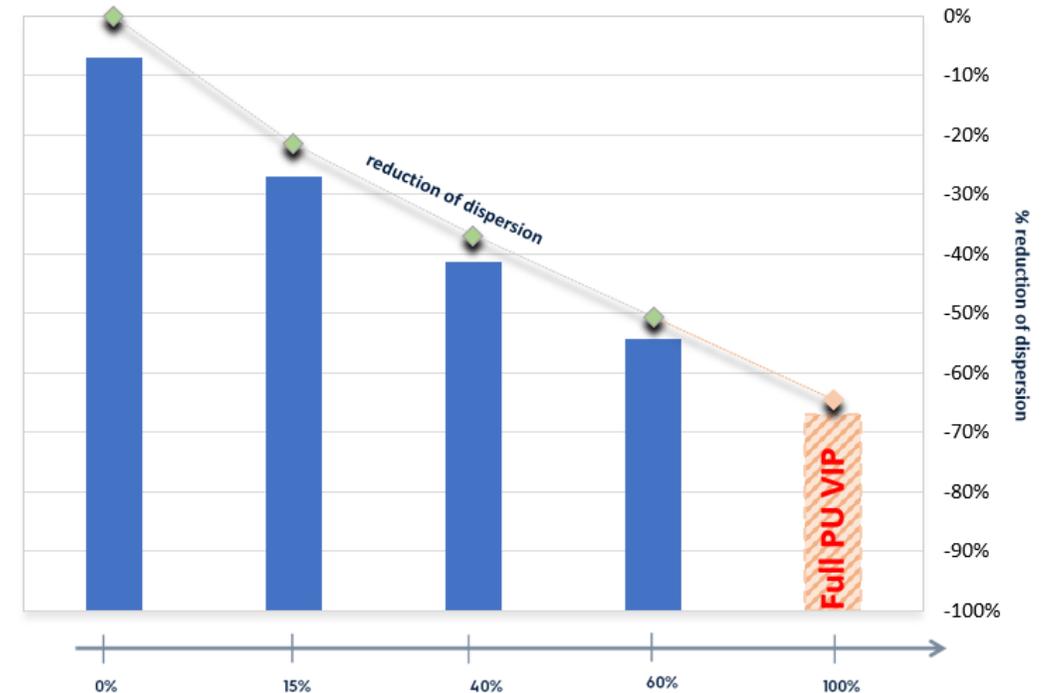
The Vicorpan panels can achieve easily the actual Class A of the energy efficiency. Proper settings of the “Full VIP” overpass this actual main class and opens the possibility to further energy savings

PRELIMINARY EVALUATION

FO	FO_V	PU_Ca
Only Foam	Foam + VIPs	PU VIP 3 sides
[W]	[W]	[W]
26.4	22.6	19.7
REF	-14%	-25%

RHL indicates a 25% improvement in thermal insulation from the “Foam only” configuration to “PU”

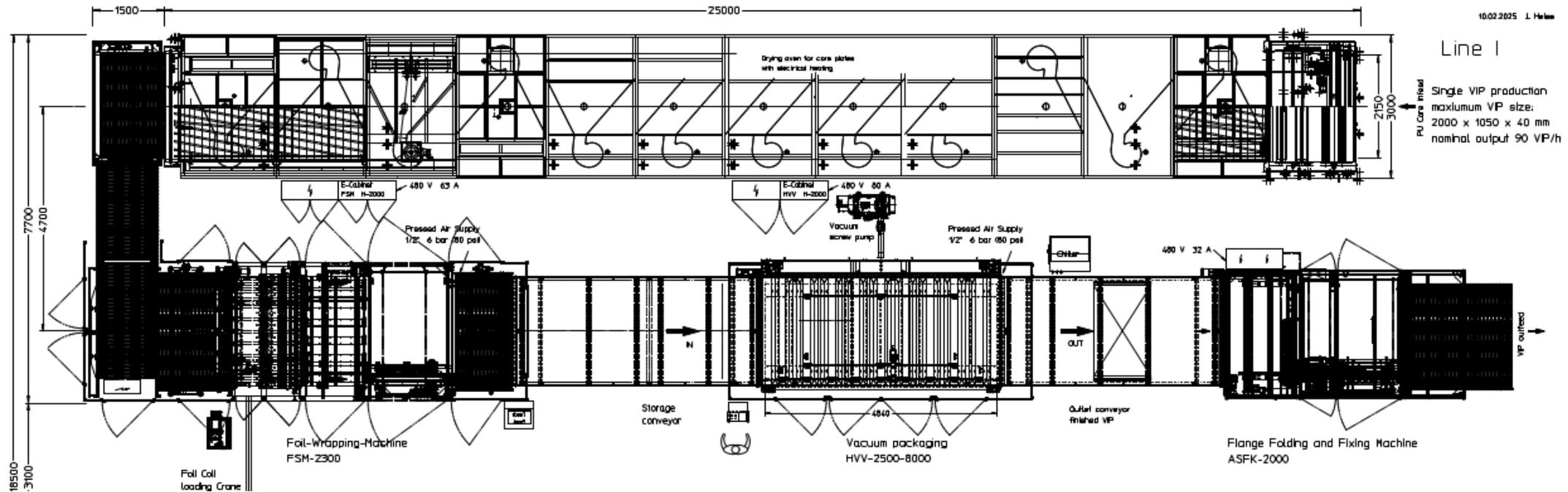
RHL vs VIP covered surface



VICORPAN: the evolution of the vacuum chamber and the offers of complete plants

The panels are prepared in line on a conveyor, enveloped automatically end then sealed into a wide vacuum chamber.

Afros, in agreement with BASF, can offer also the first part of the plant, where the cores are produced from flat mould installed on presses similar to the convertible press prepared for the Vicorpan prototype Plant



VICORPAN: Recyclability

Demonstrations of recyclability and reuse

The Vicorpan panels, during shredding, do not make difference from std refrigerators without VIP panels



The complete VIP panels can be removed and reused

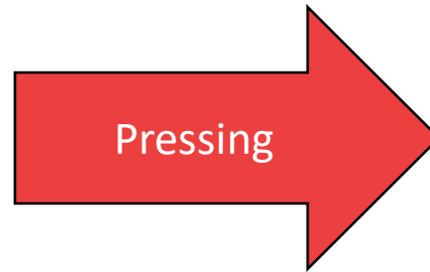
The core of the panels , as well as the normal foam, can be reused as core of new panels re-assembled as compressed powder in new VIPs from waste PU



Eco-VIPs from recycle of waste PU



PU powder

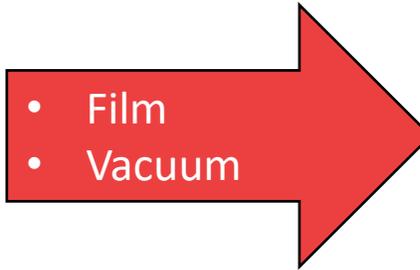


Eco-core



Eco-VIPs from recycle of waste PU

**PATENT
PENDING**



Eco-core

$\lambda \geq 5.2 \text{ mW/m/K}$

Eco-VIP



VICORPAN: the Project Main application today

Boxes for vaccines



High end refrigerators



VICORPAN: the Project Main application today

Insulated trailers



Professional refrigerators



VICORPAN: the Project Main application today

Containers with thermal masses



Walk-in coolers



LIFE20 CCM/IT/001644 VICORPAN



Thanks for your attention!

Q&A

