
Modeling of a glass mineral wool process in view of Life Cycle Analysis

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Processes and Sustainable development

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Contents

1. Introduction
2. The production process
3. LCA and modeling
4. Results and advantages
5. Conclusion

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Knauf Insulation

MINERAL WOOL

Glass
Mineral
Wool



with **ECOSE**
TECHNOLOGY

Rock
Mineral
Wool



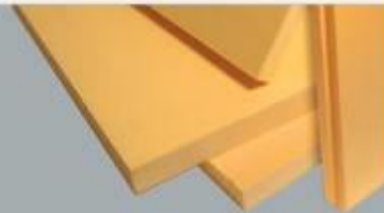
PLASTIC FOAMS

EPS



Expanded Polystyrene

XPS



Extruded Polystyrene

WOOD WOOL

Heraklith®



Heradesign®



Knauf Insulation

- LCA to Knauf Insulation
 - First: market demand (Environmental Product Declaration (E.P.D.), etc.)

DECLARATION
ENVIRONNEMENTALE et SANITAIRE
CONFORME A LA NORME NF P 01-010

Acoustilaine 035 100 mm

Laine de verre



Janvier 2013

N° 09-293 : 2012

Cette déclaration est présentée selon le modèle de Fiche de Déclaration Environnementale et Sanitaire validé par l'AIMCC (FD&S Version 2005)

Knauf Insulation Acoustilaine 035 100 mm avec ECOSE Technology
1

Le 9 janvier 2013



Institut Bauen
und Umwelt e.V.



Umwelt-Produktdeklaration
nach ISO 14025



Holzwole-Mehrschichtplatten
mit Steinwollekern

Heraklith.

Heraklith® is registered trademark of



Deklarationsnummer
EPD-KNI-2011711-D

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www.bau-umwelt.com



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DECLARACIÓN AMBIENTAL DE PRODUCTO
DAPc® 001.006

PRODUCTO
**PANEL PLUS (TP 138)
de 100 mm**



EMPRESA
KNAUFINSULATION

DESCRIPCIÓN DEL PRODUCTO

Panel semi-rígido de Lana Mineral de Vidrio no hidrófila, sin revestimiento, de 100 mm de espesor nominal, 1.350 mm de longitud y 600 mm de anchura

DE ACUERDO CON LAS NORMAS
ISO 14.025 e ISO 21.930

RCP DE REFERENCIA

RCP001 - Productos aislantes térmicos - V.1 (2010)

PLANTA PRODUCCIÓN

KNAUF INSULATION LANNEMEZAN SAS
501, Voie Napoléon III
F-65300 Lannemezan (France)

VÁLIDEZ

Desde: 31.01.2013
Hasta: 30.01.2018

La validez de la DAPc® 001.006 está sujeta a las condiciones del reglamento DAPc®. La edición vigente de esta DAPc® es la que figura en el registro que mantiene CAATEEB; a título informativo, se incorpora en la página web del Sistema <http://es.caateeb.net/dapc>

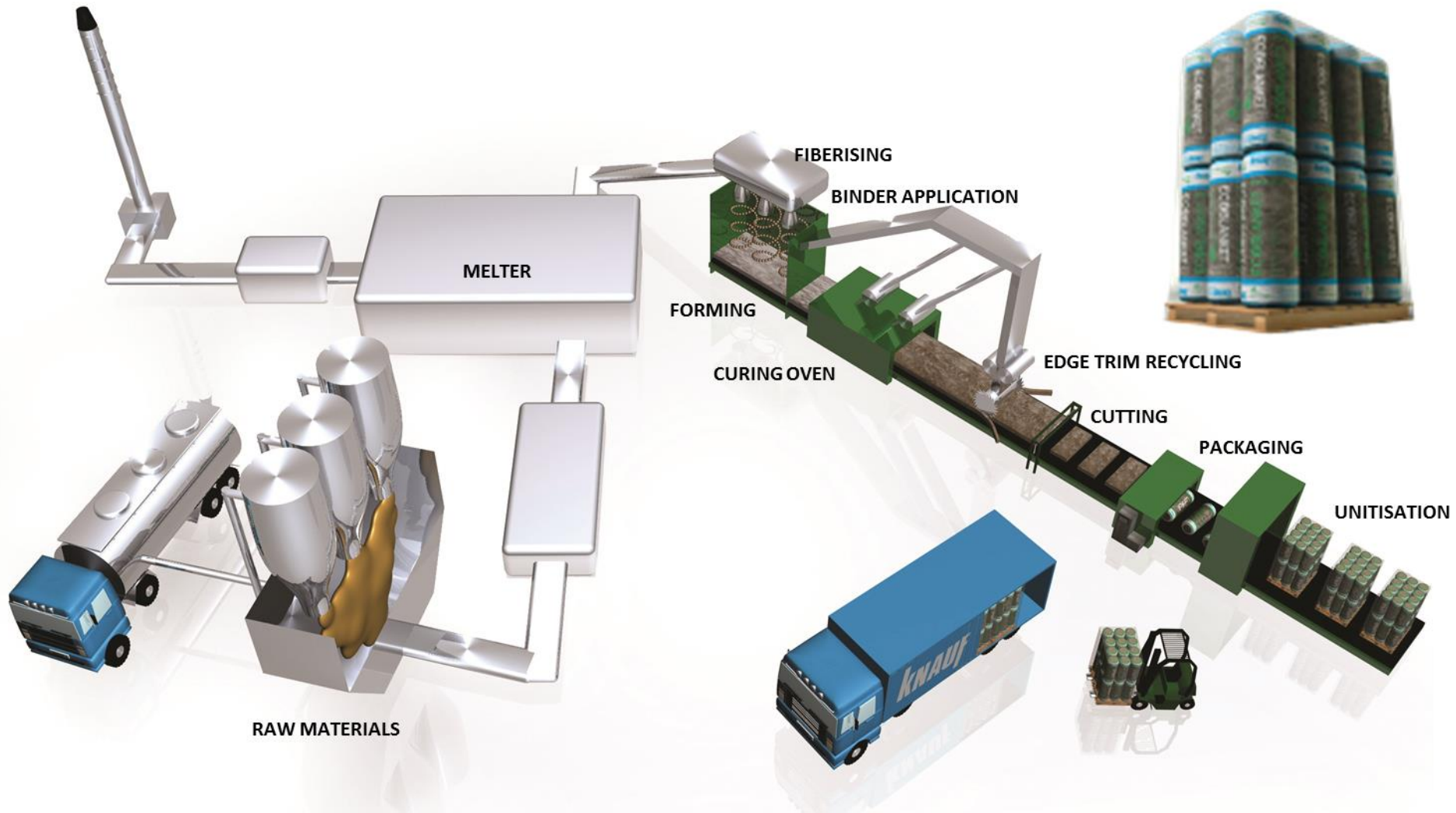
Knauf Insulation

- LCA to Knauf Insulation
 - ❑ First: market demand (Environmental Product Declaration (E.P.D.), etc.)
 - ❑ Then ECO-DESIGN

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The production process



The production process



Binder : formaldehyde → bio-based from plant starch

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6. Conclusion

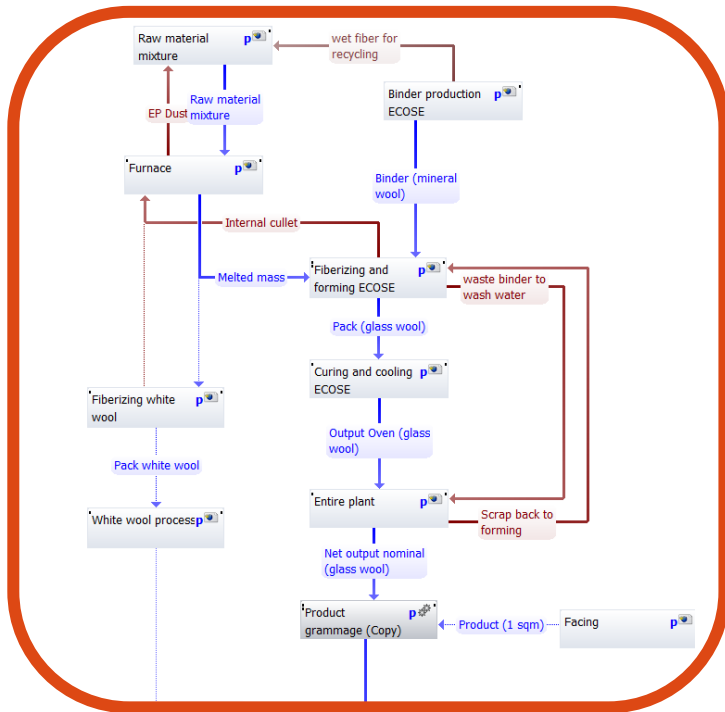
LCA methodology

- Special attention to allocation procedure (economic)
- Functional unit: production of 1 m³ of a specific product
- Use phase not included

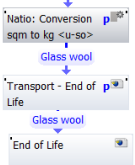
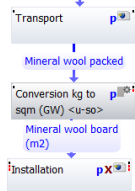
Modeling

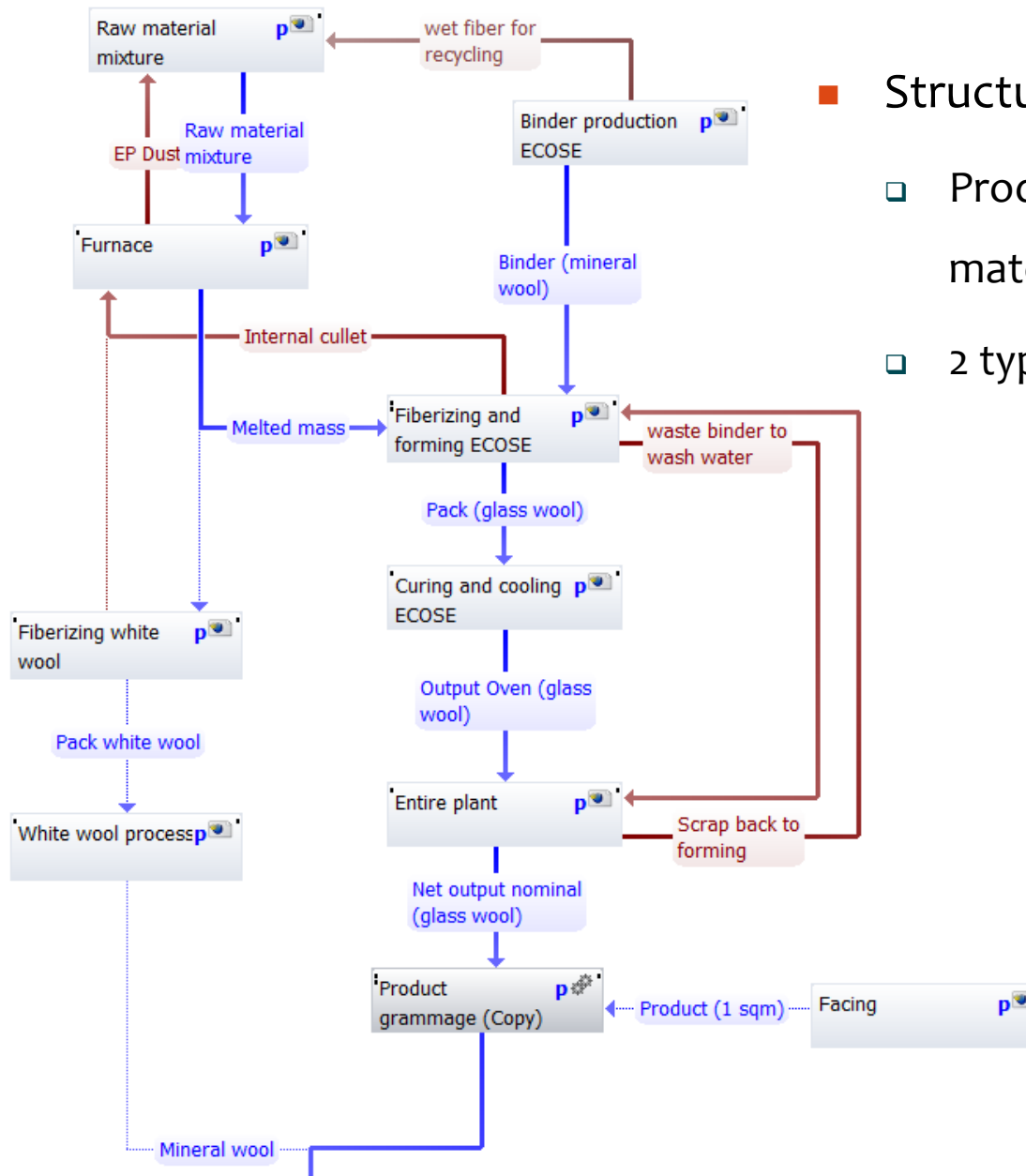
- In GaBi 6
 - Plans of different levels
 - In a plan: other plans or processes.
 - Flow to link plans and/or processes
- General operation principle: identical in all plants
- A unique model
- Structured // plant organization

Modeling - unique model

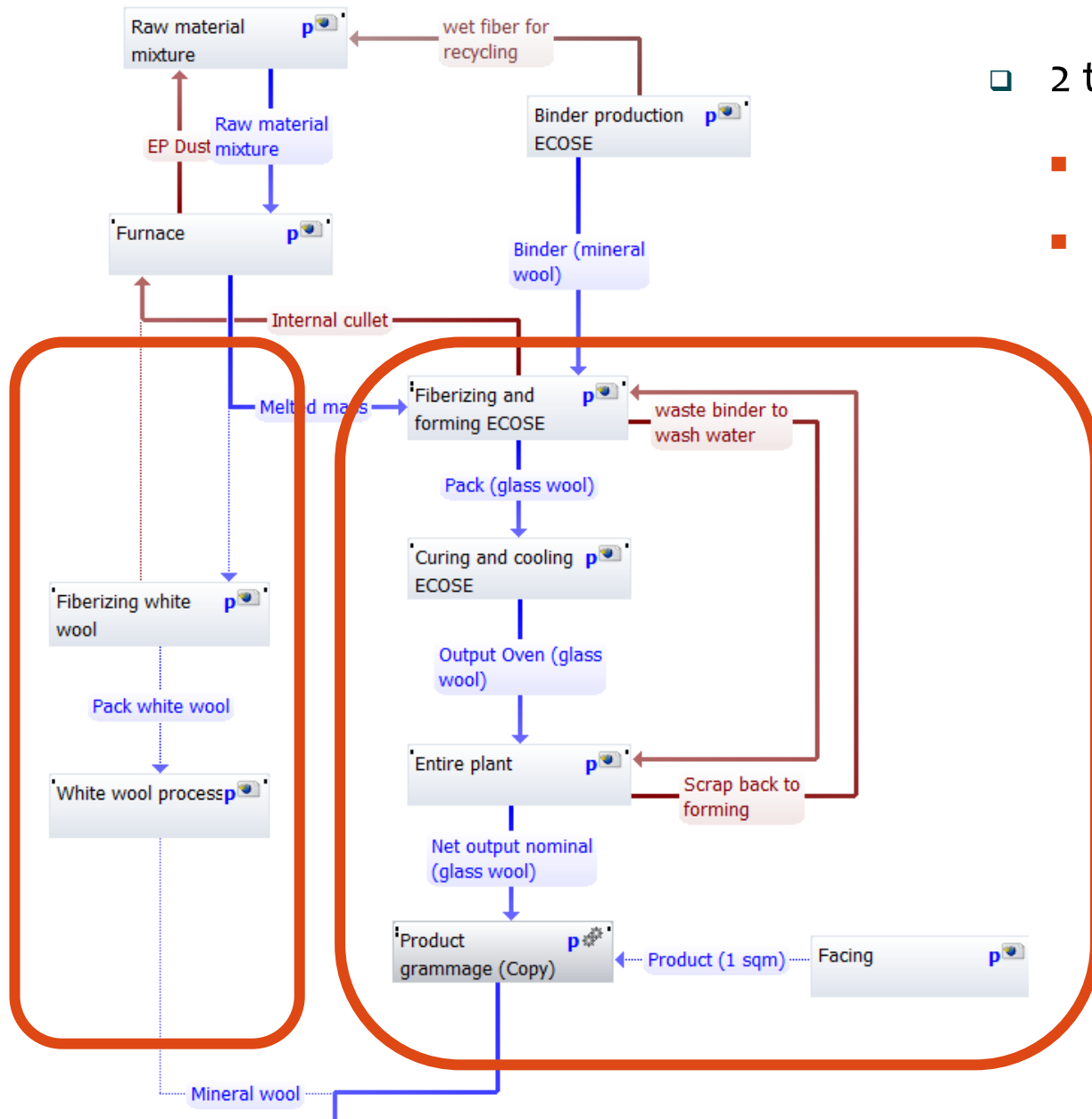


- Structured // plant organization





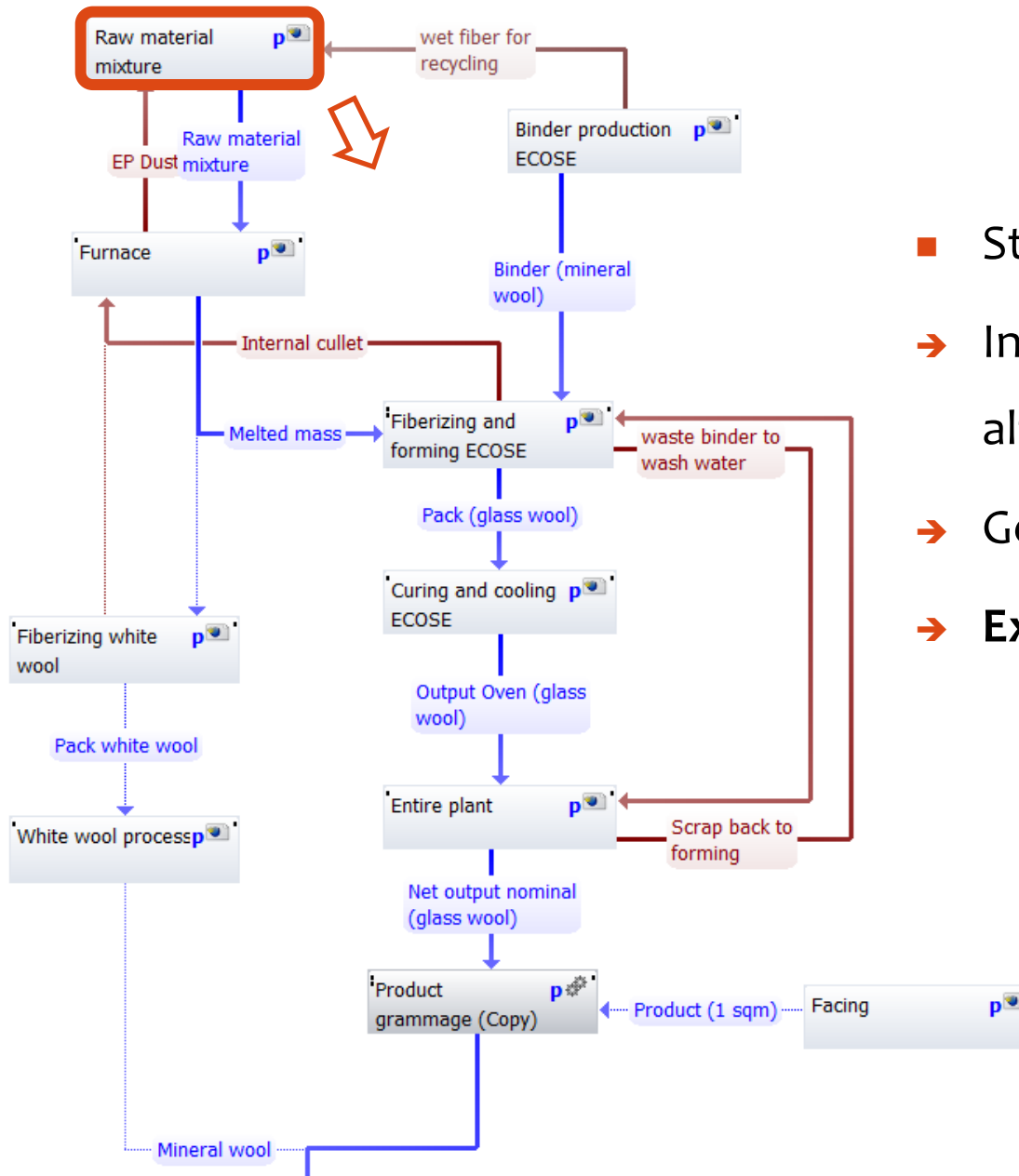
- Structured // plant organization
 - Product flow and recycled materials
 - 2 types of products



□ 2 types of products

■ Blowing wool

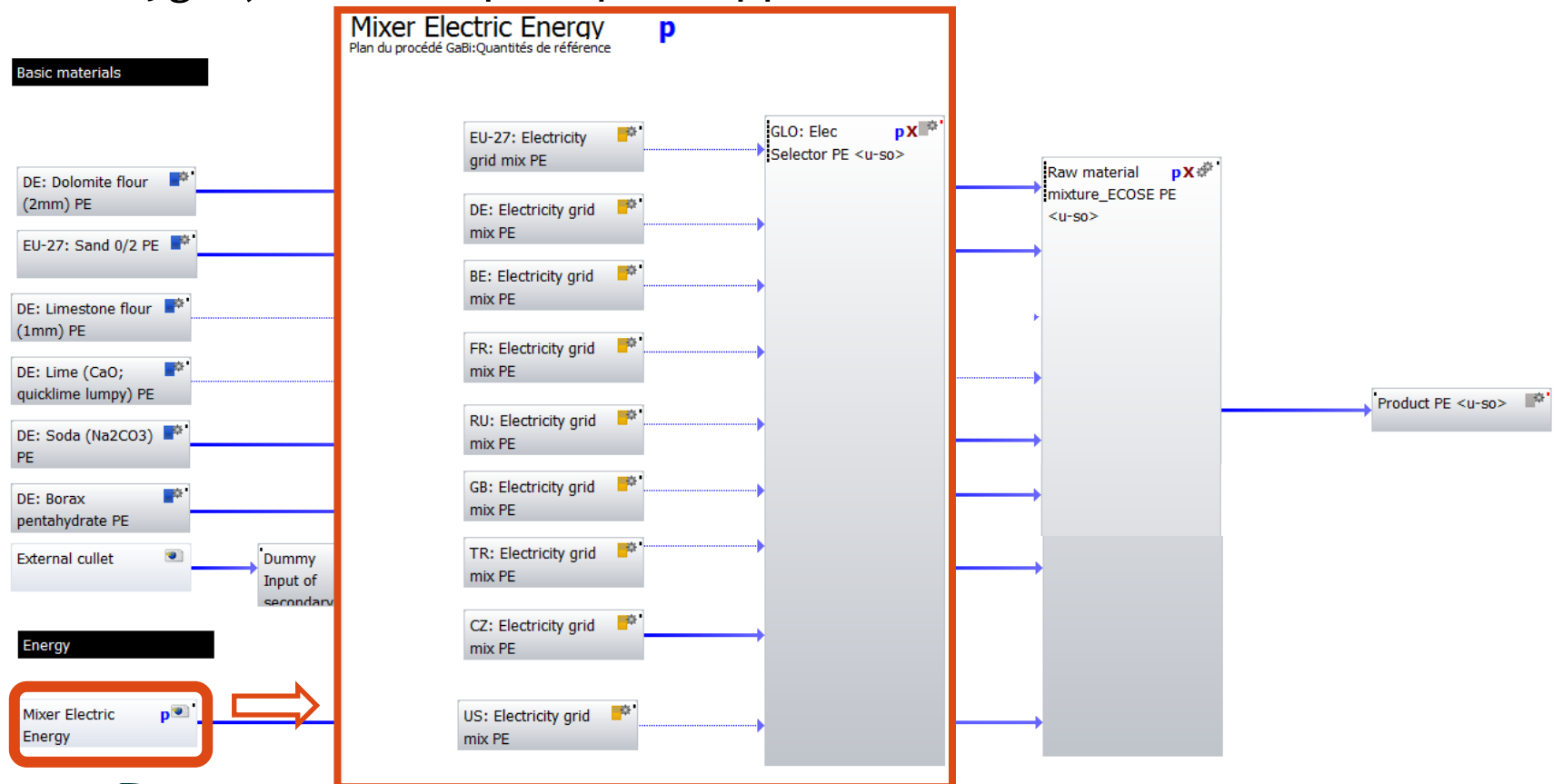
■ Wool



- Structured // plant organization
- ➔ In each plan: inclusion of all alternatives
- ➔ Generic model
- ➔ **Example: Raw materials**

Raw material mixture plan

- Includes all possible (potential) raw materials
- Electric Energy Mixer: allows to choose the electricity grid mix
- In the process parts where other energy sources are used (natural gas and/or oxygen), the same principle is applied



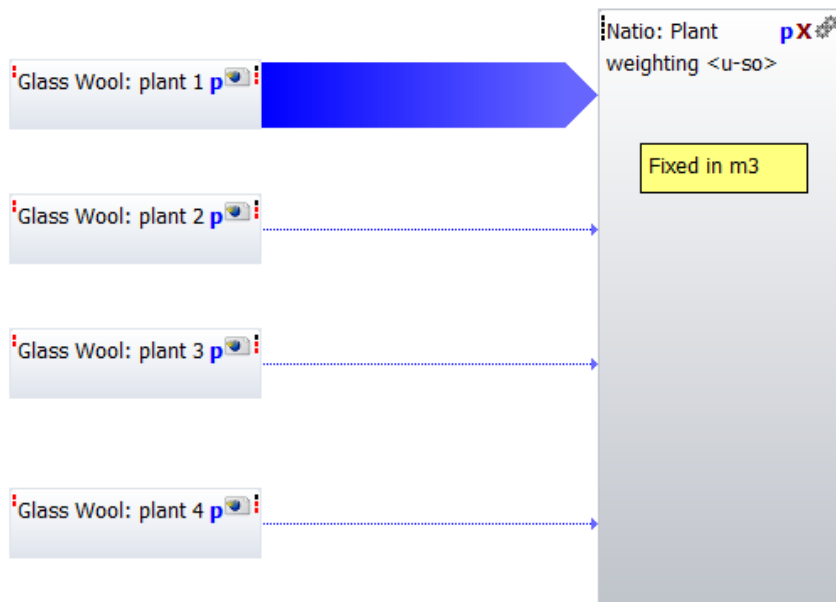
Modeling

- By reproducing the generic plan in a weighting plan:
Combination of factories possible

1. Plant weighting: glass wool product - KNAUF INSULATION

Plan du procédé GaBi: Mass [kg]

p



Modeling

- Parameters: Define
 - Amount of each raw material
 - Transport distance
 - Energy consumption
 - Origin of energy
 - Amount of waste/co-product
- **Plant parameters**
- Example: the raw material mixture plan parameters

Modeling

→ Plant parameters

■ Example: the raw material mixture plan parameters

Plant 1				
Raw material mixture				
IN				
Borate	Glass Wool: plant Borate			[kg] Borate consumption (raw material)
Dolomite	Glass Wool: plant Dolomite			[kg] Dolomite consumption (raw material)
Limestone	Glass Wool: plant Limestone			[kg] Limestone consumption (raw material)
Calcinated limestone	Glass Wool: plant Calcinated_lime			[kg] Calcinated limestone consumption (raw material)
Sand	Glass Wool: plant Sand			[kg] Sand consumption (raw material)
Soda	Glass Wool: plant Soda			[kg] Soda consumption (raw material)
External cullet	Glass Wool: plant Ext_cullet			[kg] external cullet consumption (raw material)
Electricity consumption at raw material m	Glass Wool: plant Elec_raw_mat			[MJ] Electricity consumption for raw material
Out				
Raw material mixture	Glass Wool: plant Raw_material_mi			[kg] Raw materila mixture
Other				
Transport distance borate by SHIP	Glass Wool: plant Di_borate_ship			[km] Transport distance by ship for borate (raw material)
Transport distance Borate by TRUCK	Glass Wool: plant Di_Borate_truck			[km] Transport distance by truck for borate (raw material)
Transport distance Dolomite	Glass Wool: plant Di_Dolomite			[km] Transport distance for dolomite (raw material)

Quantities

Modeling

- Parameters: Define the product characteristics
 - Dimension
 - Type (blowing wool/ wool)
 - Density
 - Facing used
 - Packaging used
 - Production plant
- ➔ **Product parameters**

Modeling

→ Product parameters

Product parameters				
Product				
LOI	1. Plant weighting	LOI	7,25	% of binder
Gros calorific value	1. Plant weighting	GCV	1,35	[MJ/kg] gross calorific value
Product type	Sous-ensemble	Product type	Glass wool	All the processes related to white wool in the plant
ONLY RELEVANT for white wool product	Sous-ensemble	White wool applic	Loft	
Product dimension				
Density nominal	1. Plant weighting	density_nominal	24,8	[Kg/m3] of finished product to calculate grammage
Product length	1. Plant weighting	Product_length	1,25	m
Product width	1. Plant weighting	Product_width	0,6	m
Thickness	1. Plant weighting	Thickness	80	mm of finished product to calculate grammage
Nb Piece pallet	1. Plant weighting	Nb PC per pale	120	pc per pallet

Modeling

- Product parameters
- Plant parameters
- **Model allows to study every products from all production plants (or combination)!**

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Advantages

- The data collection is simplified

2013_07_30_data collection sheet_0

Fichier Accueil Insertion Mise en page Formules Données Révision Affichage Acrobat

Calibri 11

Standard

% 000 +,0 -,0

C193 Antifoam

	A	B	C	D	E	F	G
1	Plant and period		Flows	Units	Line	Additionaln information required ...	Comments
2			In principle, information in blue is coming from SoFi		Data entry is required		
3	Raw material mixture						
4	IN	Raw material	Borate	kg		Emissions factor	
5	IN		Dolomite	kg		Emissions factor	
6	IN		Calcinated dolomite	kg		Emissions factor	
7	IN		Limestone	kg		Emissions factor	
8	IN		Sand	kg		Emissions factor	
9	IN		Soda (Na2CO3)	kg		Emissions factor	
10	IN		Nepheline	kg		Emissions factor	
11	IN		Ext Cullet	kg		Emissions factor	
12	IN	Recycling good	EP Dust	kg	0,00		From furnace
13	IN		Wet fiber	kg	0,00		From binder ECOSE
14	IN	Energy	Electricity	MJ			
15	OUT	Products	Raw material mixture	kg	0,00		
16		Mass balance	IN	kg	0,00		
17			OUT	kg	0,00		
18			Delta	%	#DIV/0!		
19	Parameter: Distance		Borate - ship	km		Location(s) of supplier(s)	
20			Borate - truck	km		Location(s) of supplier(s)	
21			Dolomite	km		Location(s) of supplier(s)	
22			calcinated dolomite-VISUCAL	km		Location(s) of supplier(s)	
23			Limestone	km		Location(s) of supplier(s)	not used
24			Sand	km		Location(s) of supplier(s)	
25			Soda (Na2CO3)	km		Location(s) of supplier(s)	
26			Nepheline	km		Location(s) of supplier(s)	
27			Ext Cullet	km		Location(s) of supplier(s)	
28		Other	Selec_Electricity				EU=1, DE=2, FR=3, GB=5, BE=6, TR=7, CZ=8
29	Furnace						
31	IN	Raw material	Raw material mixture	kg	0,00		
32	IN	Recycling good	Int Cullet	kg			From fubisation
33	IN	Energy	Electricity (final)	MJ			
34	IN		Natural Gaz	MJ		Emissions factor	CO2 from combustion has to be added in emission
35	IN		Oxygen	Nm3			Ensure that electricity consumption is not already taken into ac
36	OUT	Products	Melted mass	kg		0,00	Vérification: the melted mass out the furnace have to be equal
37	OUT	Recycling good	EP Dust	kg			to raw material/ collected from the precipitator

Advantages

- The data collection is simplified
- EPD: faster

Product parameters				
Product				
LOI	1. Plant weighting	LOI	7,25	% of binder
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Product length	1. Plant weighting	Product_length	1,25	m
Product width	1. Plant weighting	Product_width	0,6	m
Thickness	1. Plant weighting	Thickness	80	mm of finished product to calculate grammage
Nb Piece pallet	1. Plant weighting	Nb PC per dalle	120	pc per pallet

Results

■ EDP

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	Knauf Insulation, d.o.o., Skofja Loka
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-KIN-20130163-CBC1-EN
Issue date	02.10.2013
Valid to	01.10.2018

DP-3 Multipurpose Rock Mineral Wool insulation

Knauf Insulation, d.o.o., Skofja Loka

www.bau-umwelt.com / <https://epd-online.com>



Institut Bauen
und Umwelt e.V.



Advantages

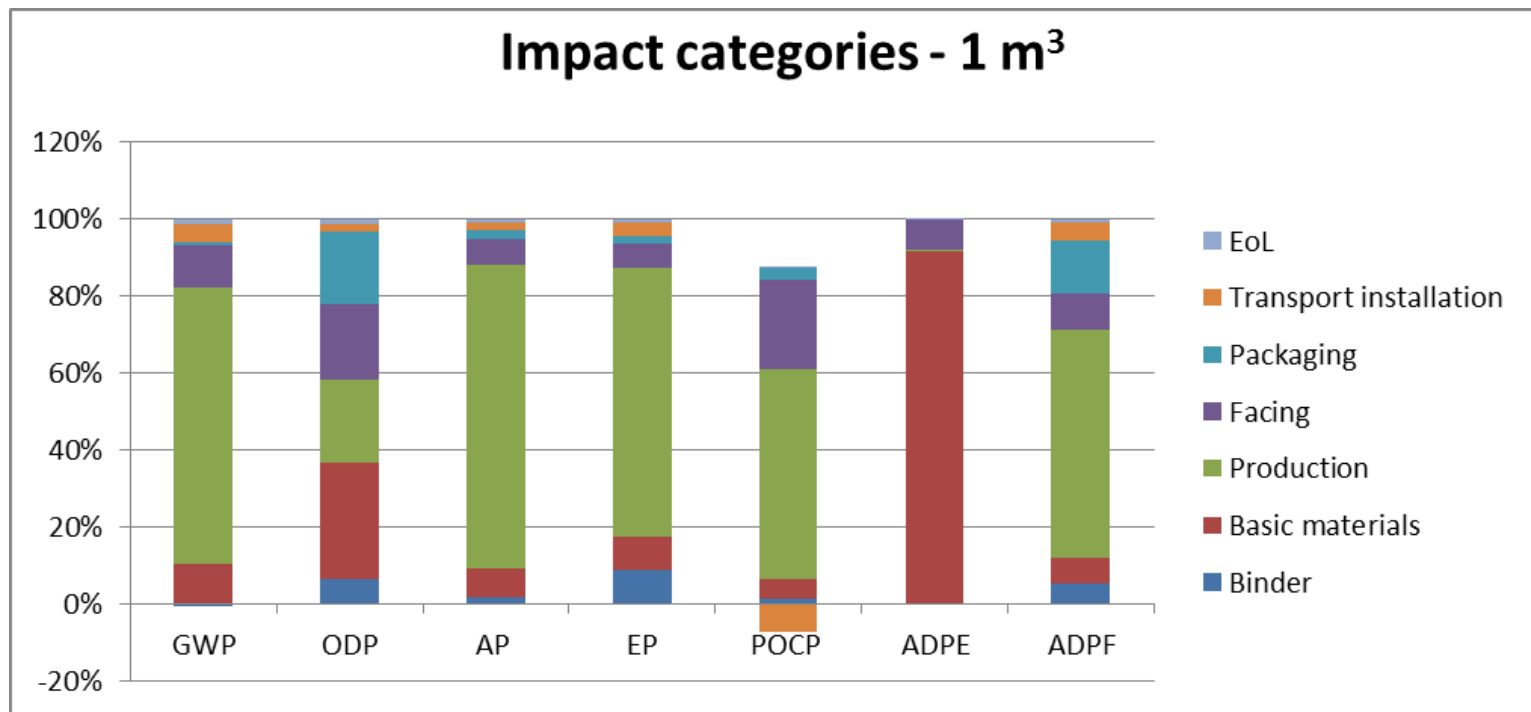
- The data collection is simplified
- EPD: faster
- Eco-design

Advantages

- Eco-design
 - LCA : powerful multicriteria tool for eco-design
 - Details
 - Quantifies
 - Avoid impact transfers (impact category / life cycle steps)
 - Model: high flexibility and simplicity for the users
 - LCA results: quick
 - Several methods
 - Identifies life cycle step high impact
 - Comparison between different plants
 - Alternative scenarios

Results

- Example for a typical product for general construction applications with a density of 24.75 kg/m³ (CML 2010)



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Conclusion

- Development of a generic model
 - Every glass mineral wool product
 - All Knauf Insulation plant
- This model
 - Simplifies the data collection procedure
 - Allows
 - EPD
 - Eco-Design

Thank you for your attention !

University of Liège

LABORATORY of CHEMICAL ENGINEERING

Processes and Sustainable development

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Modeling

- Example: used of thermal energy → fiberizing and forming

Fiberizing and forming ECOSE

Plan du procédé GaBi: Mass [kg]

