Using an Acrylic Resin to Make MDF Thermoformable

YouTube: MDF wave board cut on CNC router

Presentation prepared for:
Wood Coatings and Substrates Conference

September 26, 2024
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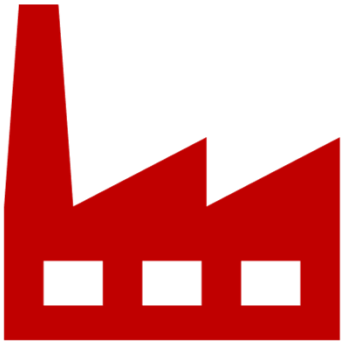
How Bridging the Divide Can Lead to Innovation

Raw Material Knowledge

Wood Panel Producer Knowledge



Understanding how raw material
Impacts production leads to innovation

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MDI Example:
"Common" Knowledge about MDI in MDF Before 2010

- 50% slower than amino resins (UF, MUF)
- Plugs blowlines
- More expensive to use than amino resins; high dosing rate relative to cost
- Highly unstable in the press – easily blows, narrow operating window
- MDI is therefore only for specialty products such as NAF, highly moisture resistant panels

Key Chemistry/Physics Parameters Affect MDF Production with MDI

- Liquid at room temperature, 100% “solids”
- Reacts with water
- Thermoset reaction rate is temperature dependent (not pH)
- Reaction is irreversible
- Polyurea (reaction product of MDI) sticks to everything
- Polyurea is a very hard, strong molecule

Observation: You don’t need to know a lot about chemistry to understand its effects

What happens when you take the chemistry differences of MDI into account in the MDF Process?

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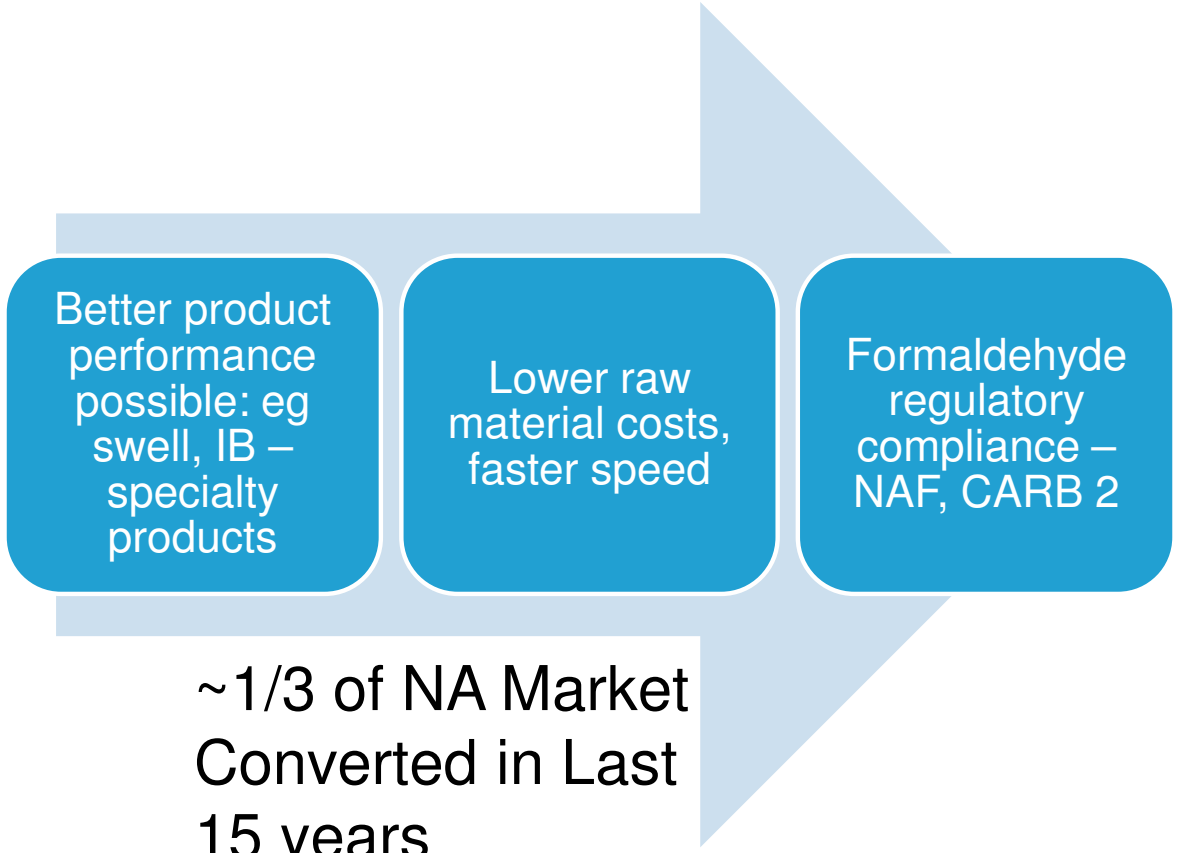
Recent History of MDF Resins

Amino Resins:
UF, MUF



pMDI

~1/3 of NA Market Converted in Last 15 years

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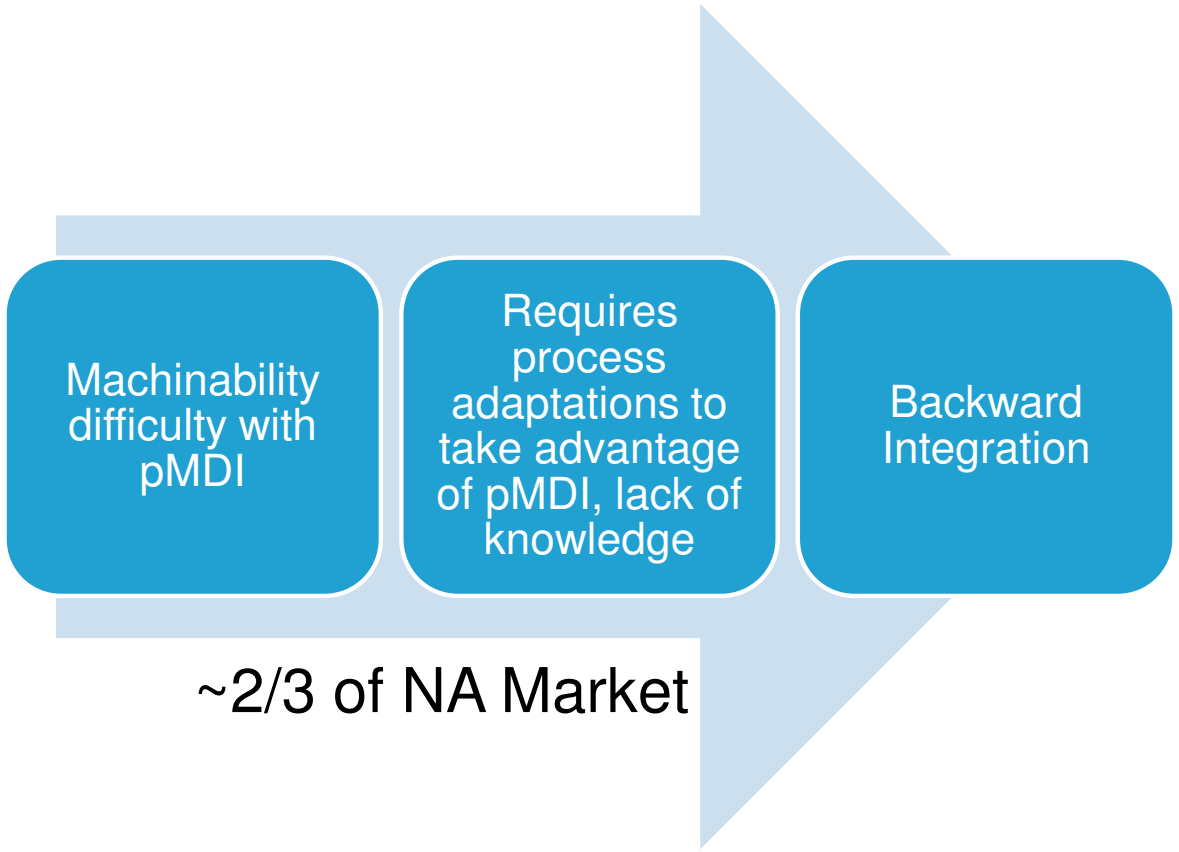
Recent History of MDF Resins

Amino Resins:
UF, MUF



How to Make Panels Made with pMDI Machine Well?

Chemically Alter pMDI

- Attempt to make pMDI softer, more like MUF
- Altering pMDI generally reduces properties, increases cost, requires higher dosing

Change Machining Techniques

- Possibly a solution, but is everyone capable of doing it?
- Who has the knowledge?

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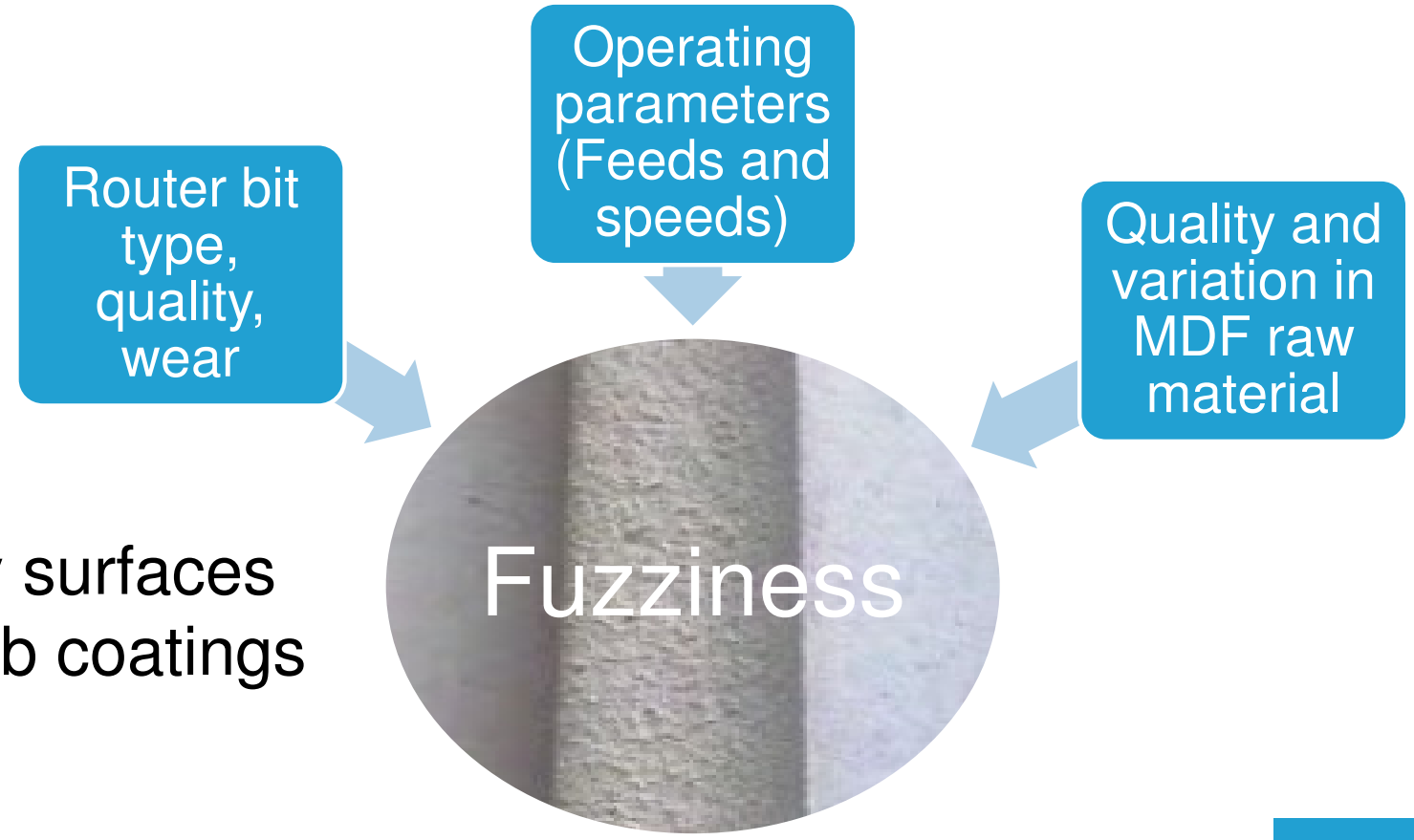
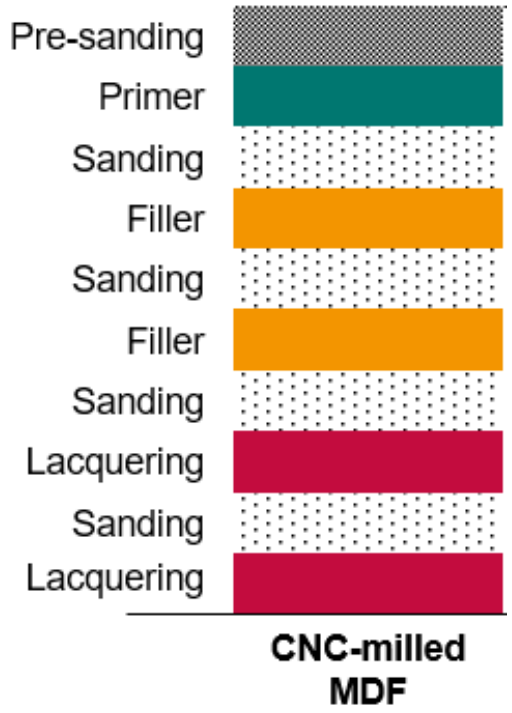
Even machining panels made with UF/MUF isn't perfect



Fuzzy surfaces
Absorb coatings

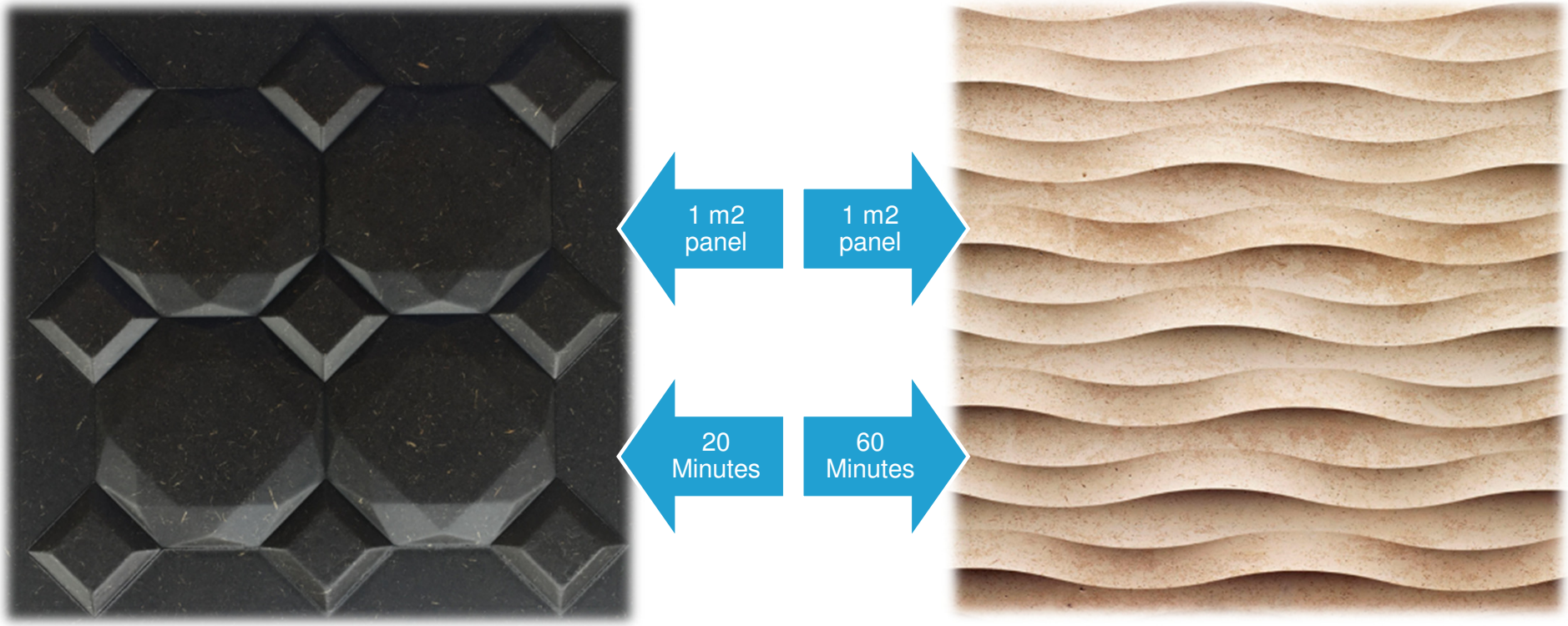
How to deal with fuzziness



Each step adds time

Time = Money

If Time = Money, What about the routing process itself?



More complex design = more time

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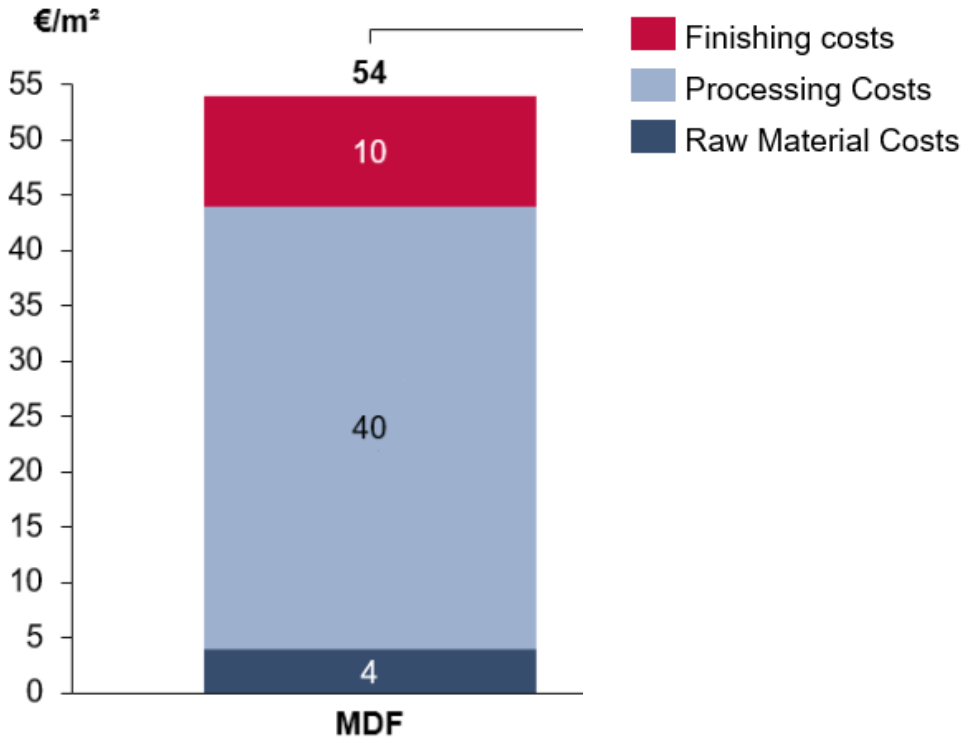
Time = Money, but how much?



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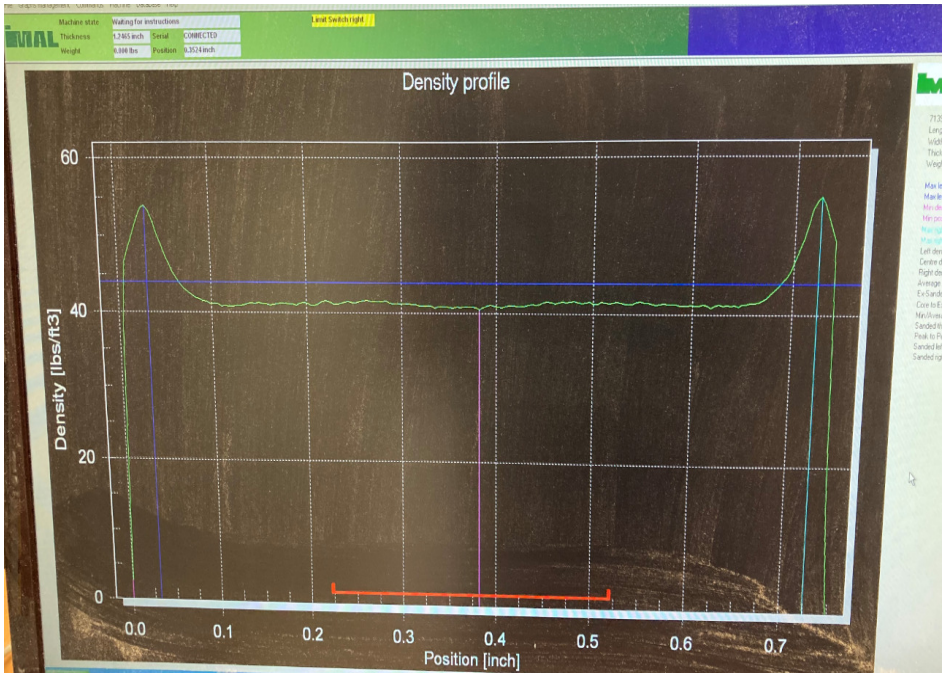
Is There a Better Way?

Can we Make MDF Thermoformable Instead?

Wood is Thermoformable – to an Extent



- By varying what we do in the press we can control the vertical density profile
- But once the resin is set, this becomes permanent
- Trying to alter this after the panel is finished is only slightly possible (shallow embossing)
- The primary purpose of the resin is to hold wood fibers together
- Thermoforming the panel therefore breaks bonds

What if We Make the Resin Thermoformable?

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A small step for you.
A giant leap for your customer.

acForm®. Groundbreaking binder technology for curved and deeply structured wood fiberboards.

Characteristics of acForm® and 3MF

Cost-efficient and sustainable production of 3D wood composites

acForm® binder

- Water-based dispersion
- Non-added Formaldehyde & low-VOC
- Non-reactive, no sticking issues
- Easy to applly

3D moldable fiberboard (3MF)

- Wood fiberboard
- Producible in large-scale production lines
- Moldable with embossing plates/rollers, on a hot press

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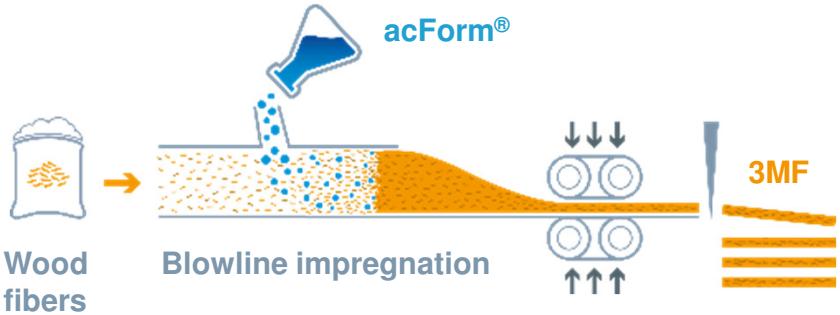
Shaping wood composites with acForm®

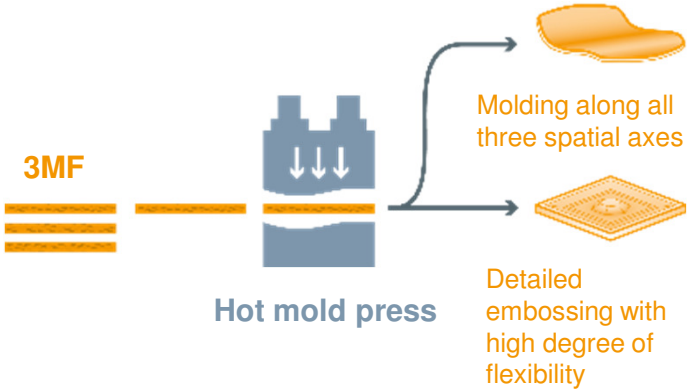
BASF's binder technology for new designs, with efficient production on hot mold press equipment

1 acForm®

2 …enables 3D-moldable wood fiberboards (3MF)



3 …for curved and deeply embossed wood composites.



Water-based binder with no added formaldehyde.

3MF can be produced on existing fiberboard production lines.

Conventional hot molding turns 3MF into 3D wood composites.

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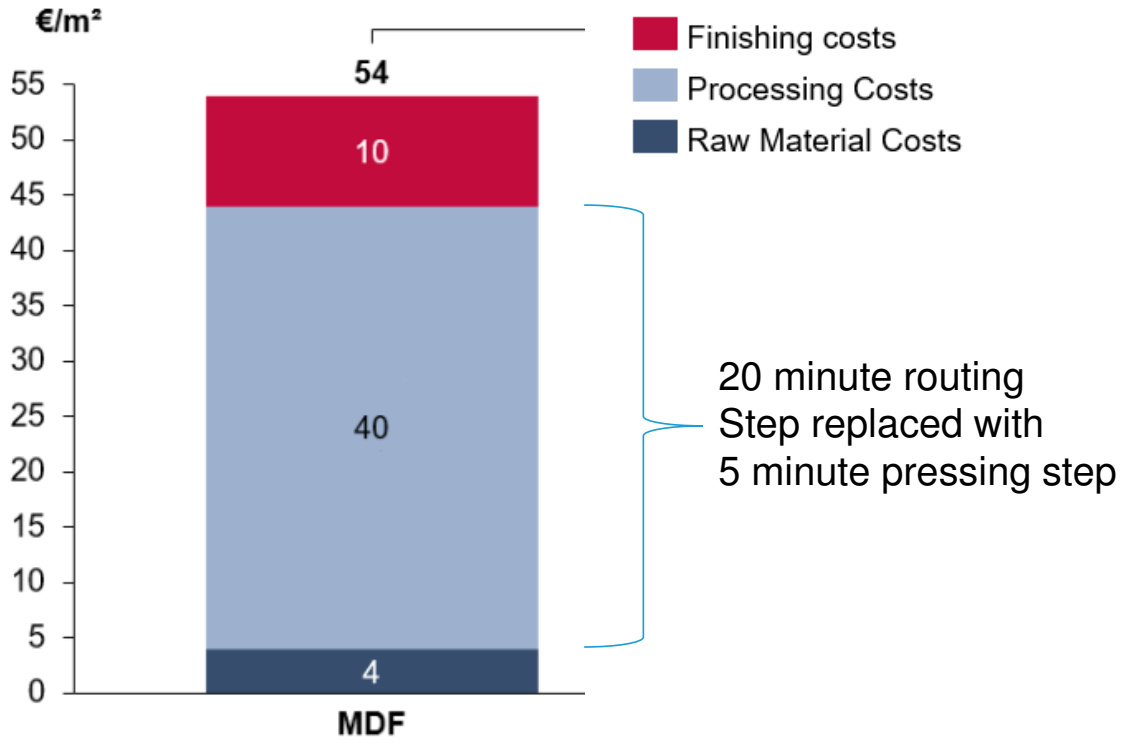
Time = Money. How much can we save?



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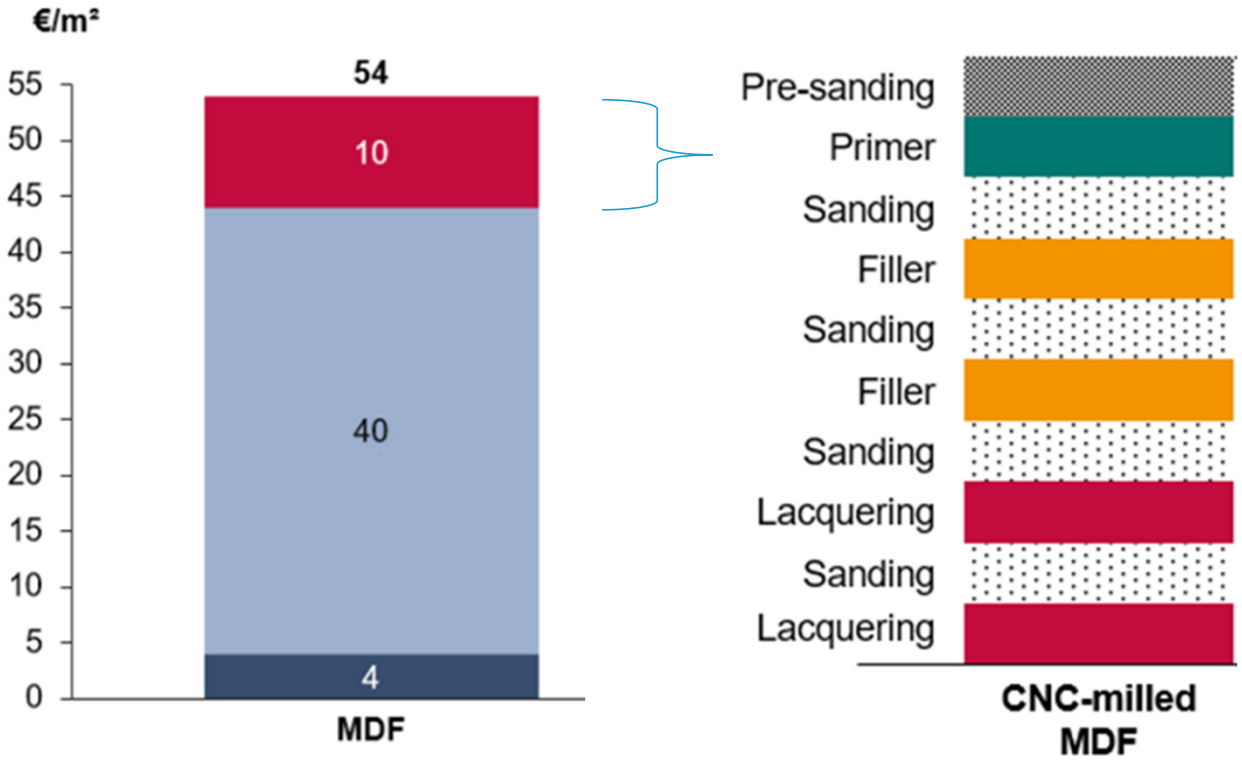
How many of these steps can we save?



Thinner areas are now
The smoothest areas

In many cases, we can go straight to finish coating

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Benefits of MDF made with acForm

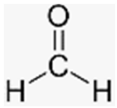
Lower cost to produce

Beautiful Design

Intricate Detail

- No router dust
- Less waste of wood, wax, resin
- Safer: no more dust fires, explosions

No Added Formaldehyde



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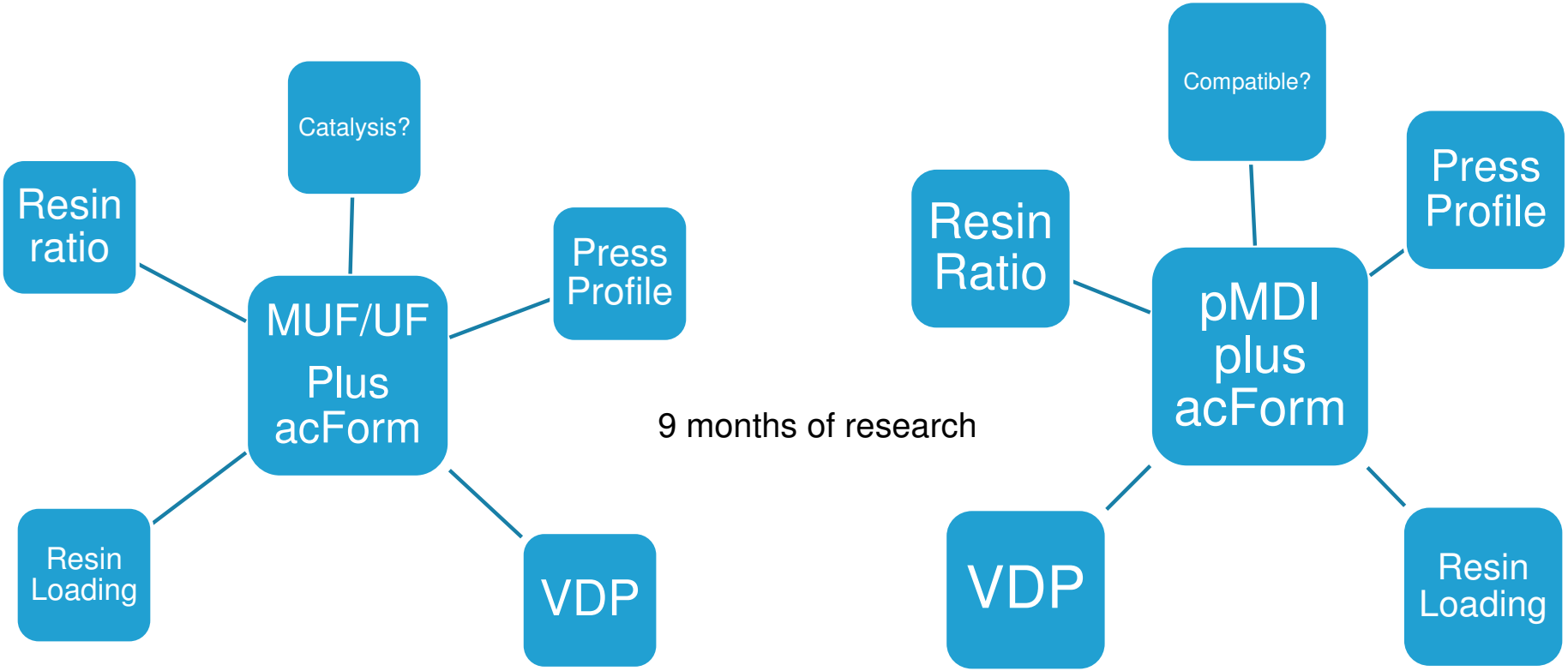
But, can you use it in conjunction with Amino Resins or pMDI?



The short answer is yes: acForm can be used with other resins to achieve the best of both worlds

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Trabattoni embossing with and without acForm

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Photo Gallery

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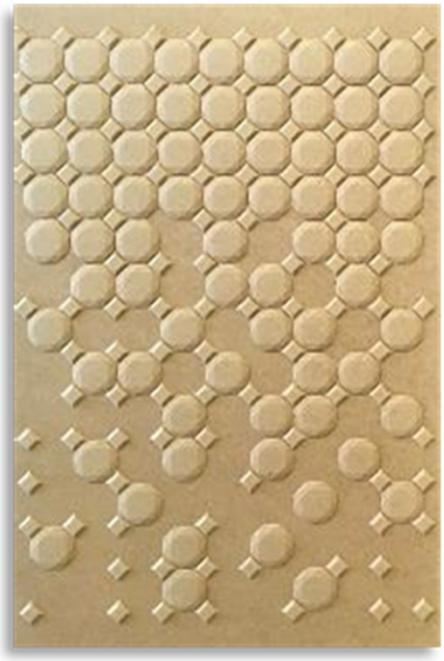

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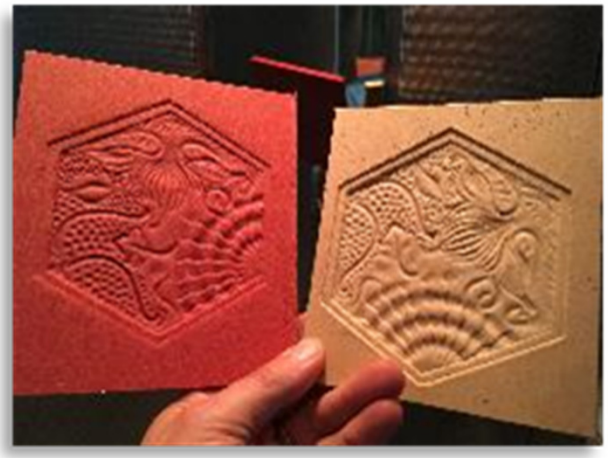

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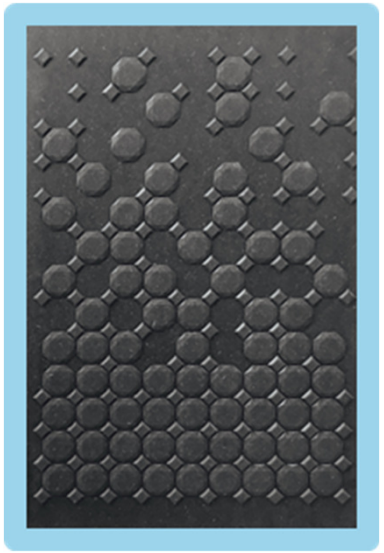

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Target market for 3MF

Furniture and Interior Design Industry

Curved parts

Embossed parts

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