



On the way to natural hightech

NRP 66 Resource Wood, 14. April 2015, Katharina Lehmann



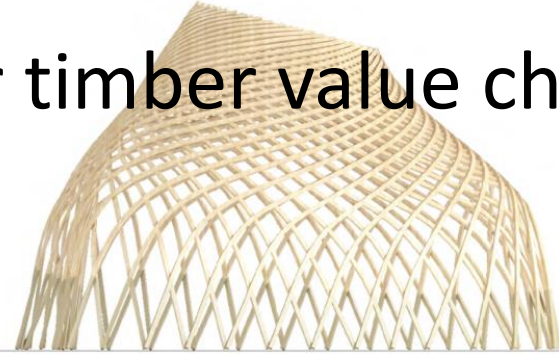


Content today: Current challenges

- Along our timber value chain

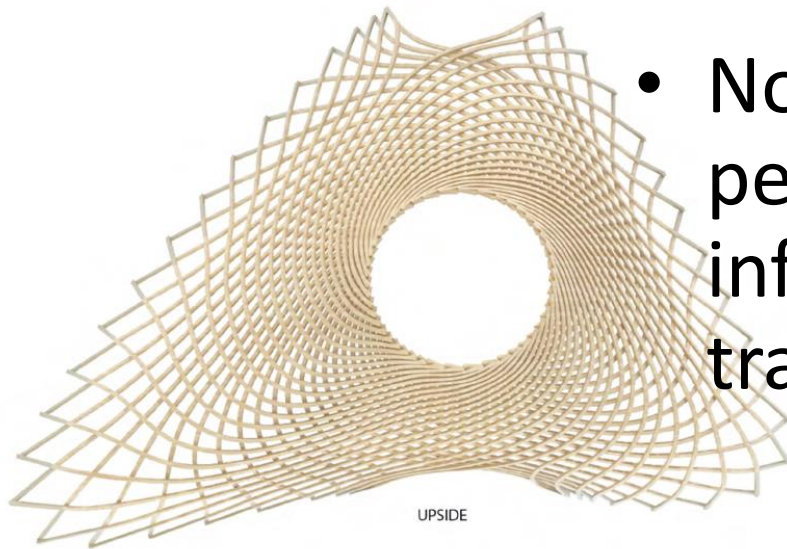


FRONT SIDE

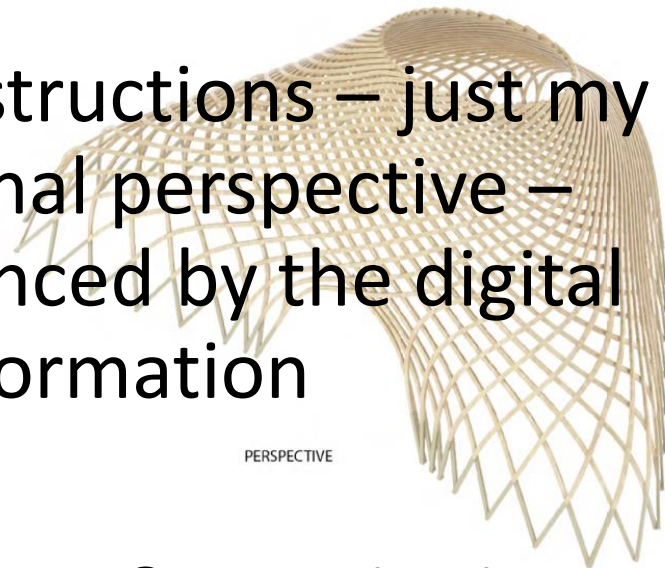


RIGHT SIDE

- No instructions – just my personal perspective – influenced by the digital transformation



UPSIDE



PERSPECTIVE

- Current R&D topics in green
- 10 thesis to be discussed

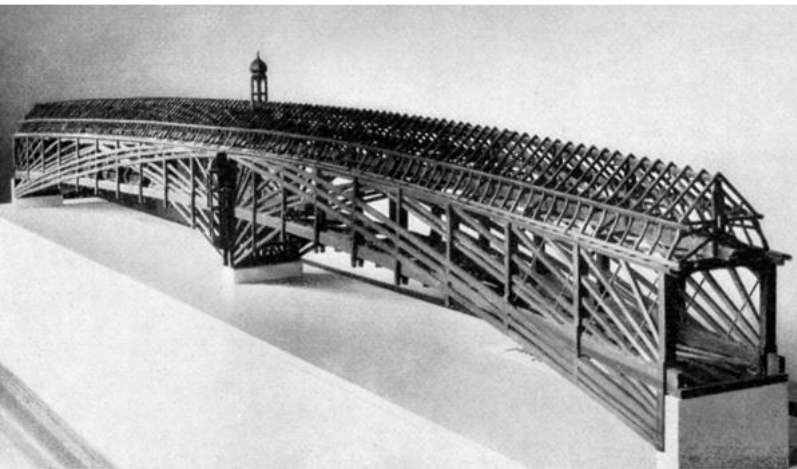


Timber Constructions in Switzerland

- where we come from



- Timber constructions used to be traditional
- Knowledge and skills as craftsmen/ carpenters
- Many small companies, also in rural environment



- **Visionary Engineers as Pioneers**
- **Engineered wood products/ semi finished products as well as building codes supported and accelerated the development**



Today: Sustainability AND Hightech

The use of timber:

- makes sense – also for the forest
- creates jobs
- reduces CO2



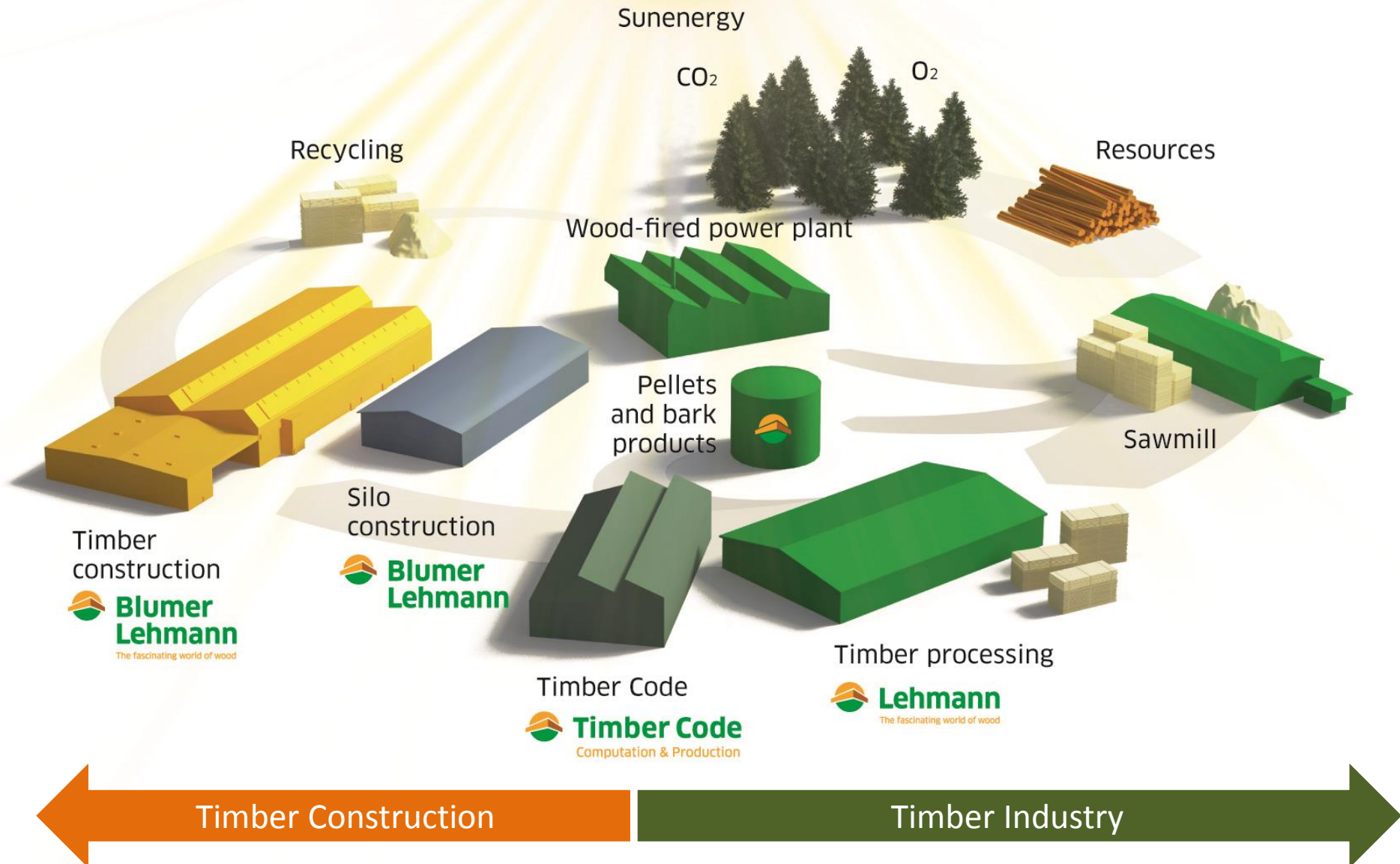
Timber constructions are today **THE** standard:

- Material
- Technology
- Machining/ Prefabrication
- Products/ markets
- Modern planning and processing methods



To show you today
among us: a few R&D
fields are still left...

141 years fascinating world of wood – along the value chain





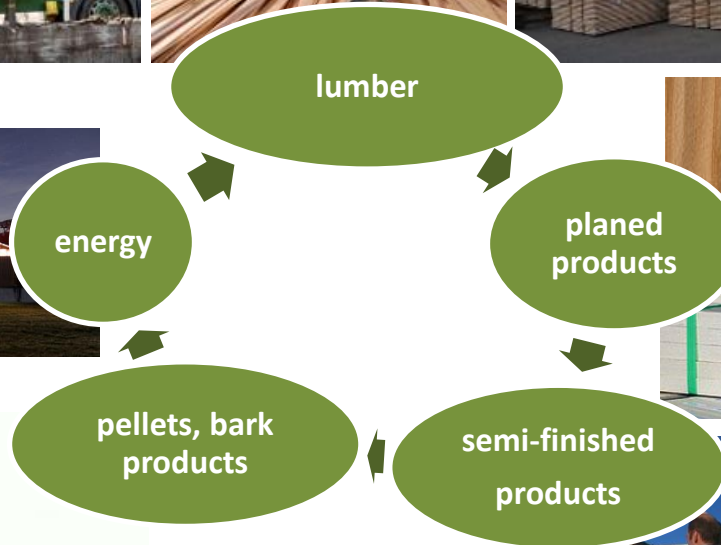
Industry – Sawmill and timber processing



Logs from the local forest



We produce the amount of electricity which we need as a production company during the year.



Lehmann

Faszination Holz





Please note:

- 100% of costs of a Swiss sawmill are in CHF
- Sawmills in Switzerland are competitive if:
 - equally high costs of logistics
 - equally high costs of material/ logs
 - we are doing our homework – along the whole value chain

There is a danger that we are going to lose the sawmill industry in Switzerland







Homework Timber Industry 1

Ohne Sägewerke keine stoffliche Nutzung,
keine Biomasse und keine CO2-Senke und
keine Argumente für den Holzbau =>
Wertschöpfungskette

- Restholzkreislauf: Brennstoffe, Kleinkraftwerke, neue Materialien
- Brettkreislauf: platten- oder stabförmige Halbfabrikate

There is a danger that we are going to loose the sawmill industry in Switzerland





Homework Timber Industry 2

- Neue Bearbeitungstechniken
- Neue Oberflächenbehandlungen/Modifikationen
- Neue Prozesse
 - Kurzfristigkeit - Geschwindigkeit
 - Abnehmende Losgrößen
 - «dessinez et achetez votre main»

**And most of all and as
a precondition:
one leading specie!**



Thesis 1

If we deny the need of a leading specie, we are going to loose our Swiss timber industry

(or at least the word industry)

Thesis 2

Beech will never

- **substitute the use of softwood timber**
- **be used as a main construction material**

⇒ There is some potential, but not in the main timber markets

Is the amount of R&D money really justified?

Sunenergy

CO₂

O₂

Recycling

Resources

Wood-fired power plant

Pellets and bark products

Sawmill

Silo construction

Timber construction



Timber Code

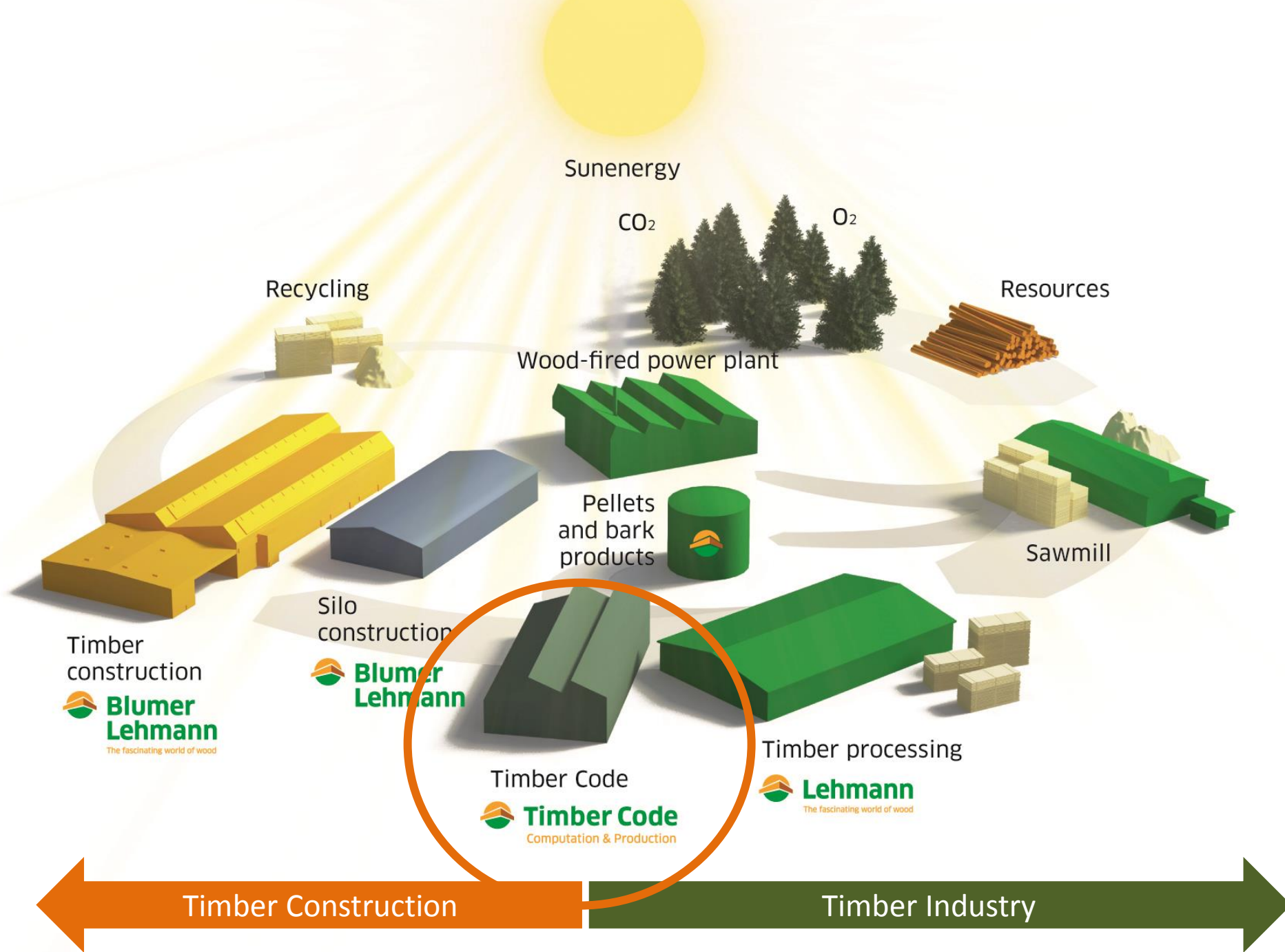


Timber processing



Timber Construction

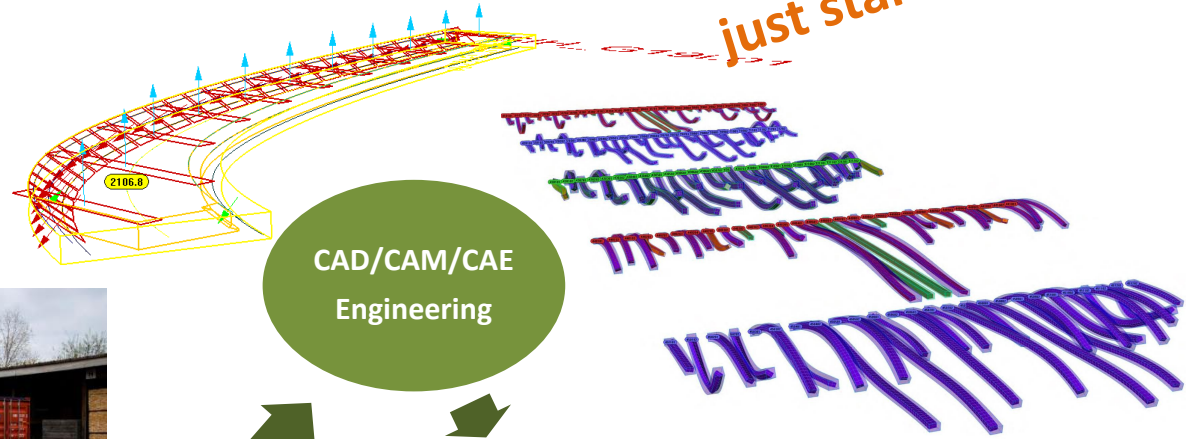
Timber Industry





Industry – Lehmann Timber Code AG

just started in 2015



CAD/CAM/CAE
Engineering

logistics

CNC-production



Timber Code
Computation & Production

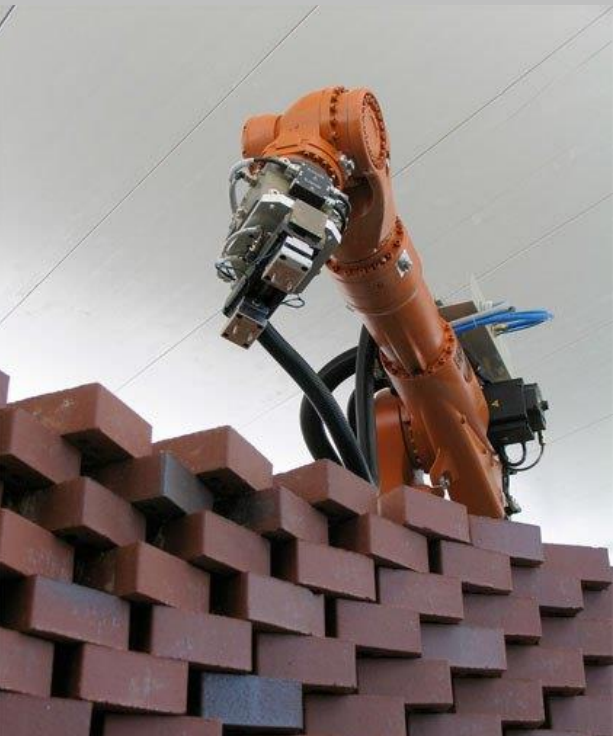
Digital technology combined with wood knowledge and skills



Digital fabrication: **Parallel research lines**

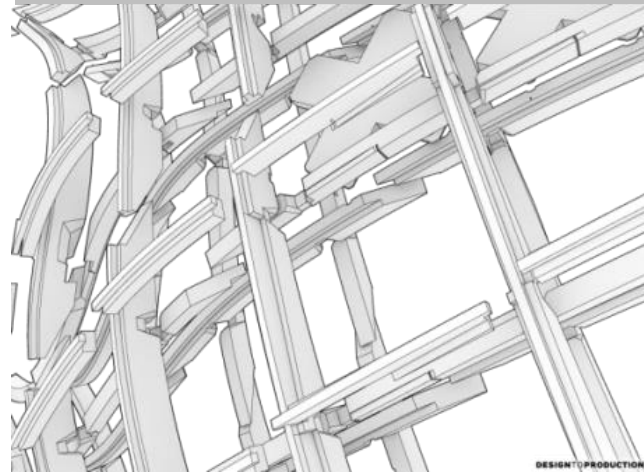
1

FORM THROUGH ASSEMBLY



2

ASSEMBLY THROUGH FORM

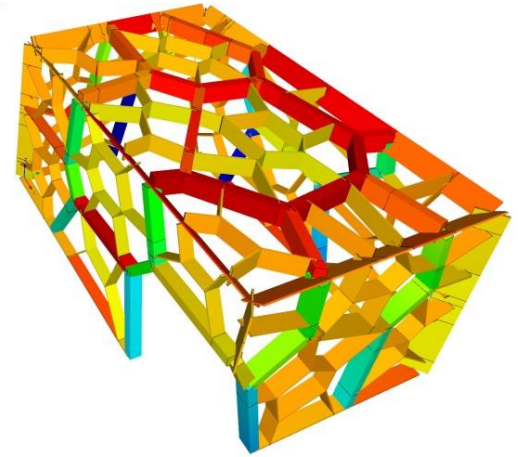
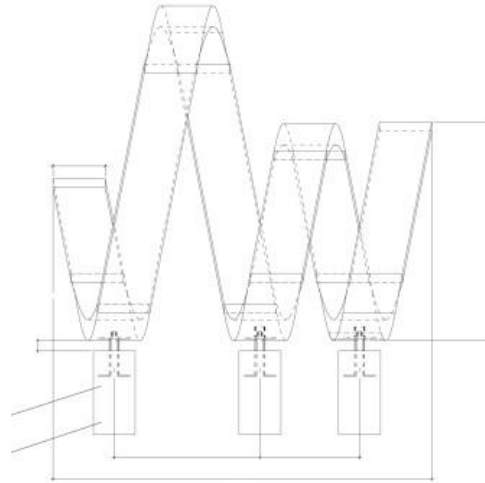
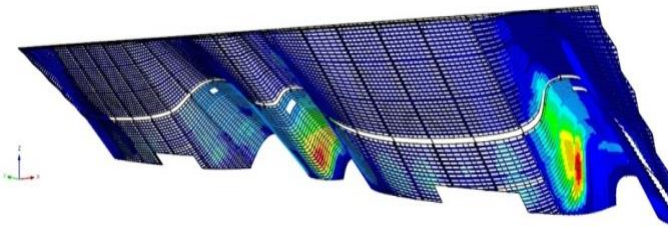


Our philosophy: **2** Prefabrication

- complete 3d modeling
- fixing of information in stiffness
- solving complexity within the factory
- as easy as possible for erection



Design to build



**complete 3d modeling – fixing of information in
stiffness – solving complexity within the factory
– as easy as possible for erection**



Prefabrication as a principle

Engineering

Planning

Production

Erection

Maintenance



Timber Code

Computation & Production



New dimensions: Unique interplay of soft- and hardware



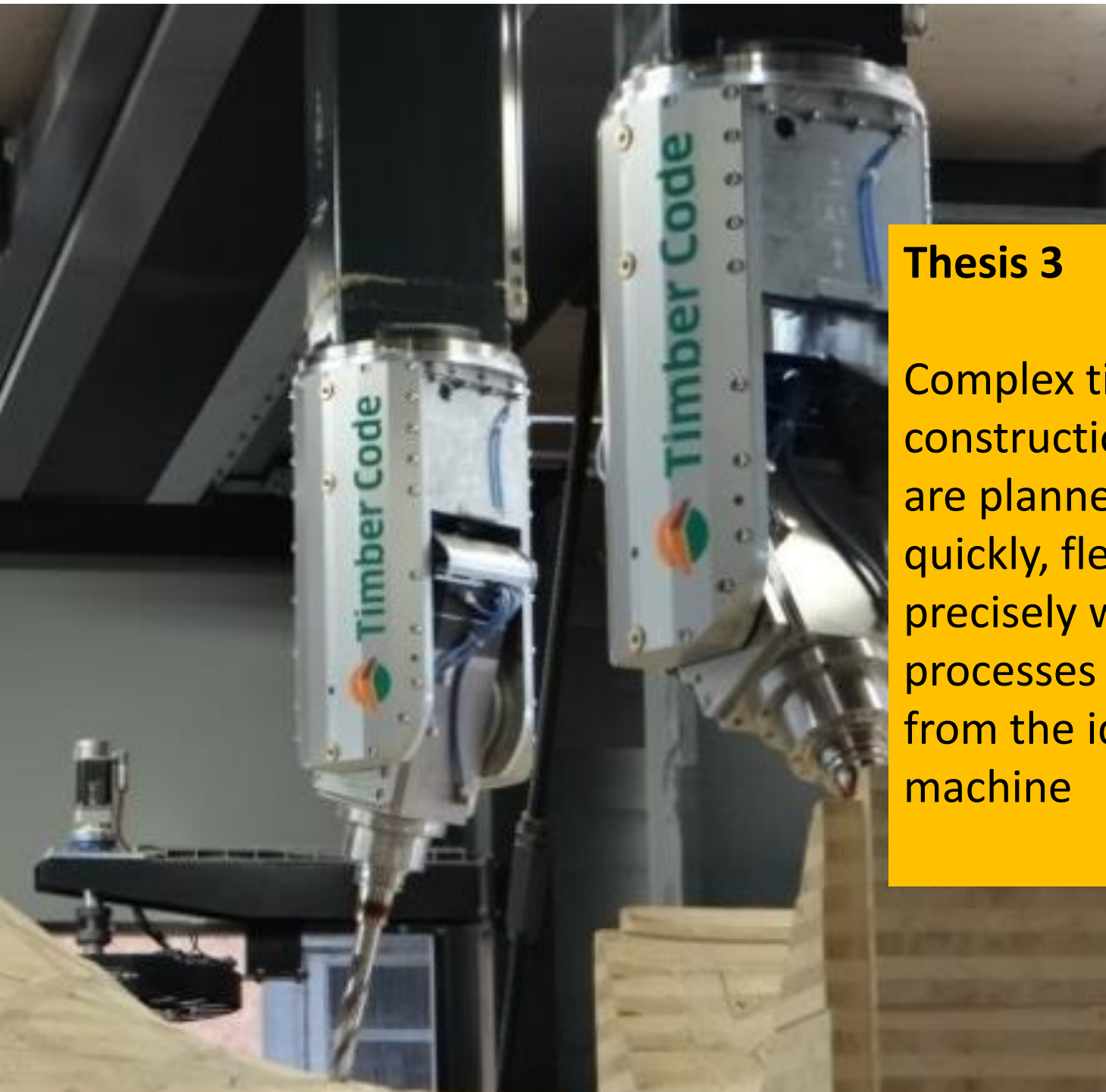
Production: a new generation of CNC Technology



Max. dimension for building parts:

Length: 27 m
Width: 5.5 m
Height: 1.35 m

- High performance
- Shuttle and dual service
- 3 5-axis units
- 8 dollies for moving the workpieces
- Simultaneous machining of all 4 sides



Thesis 3

Complex timber construction components are planned and produced quickly, flexibly and precisely with digital processes – from the idea to the machine

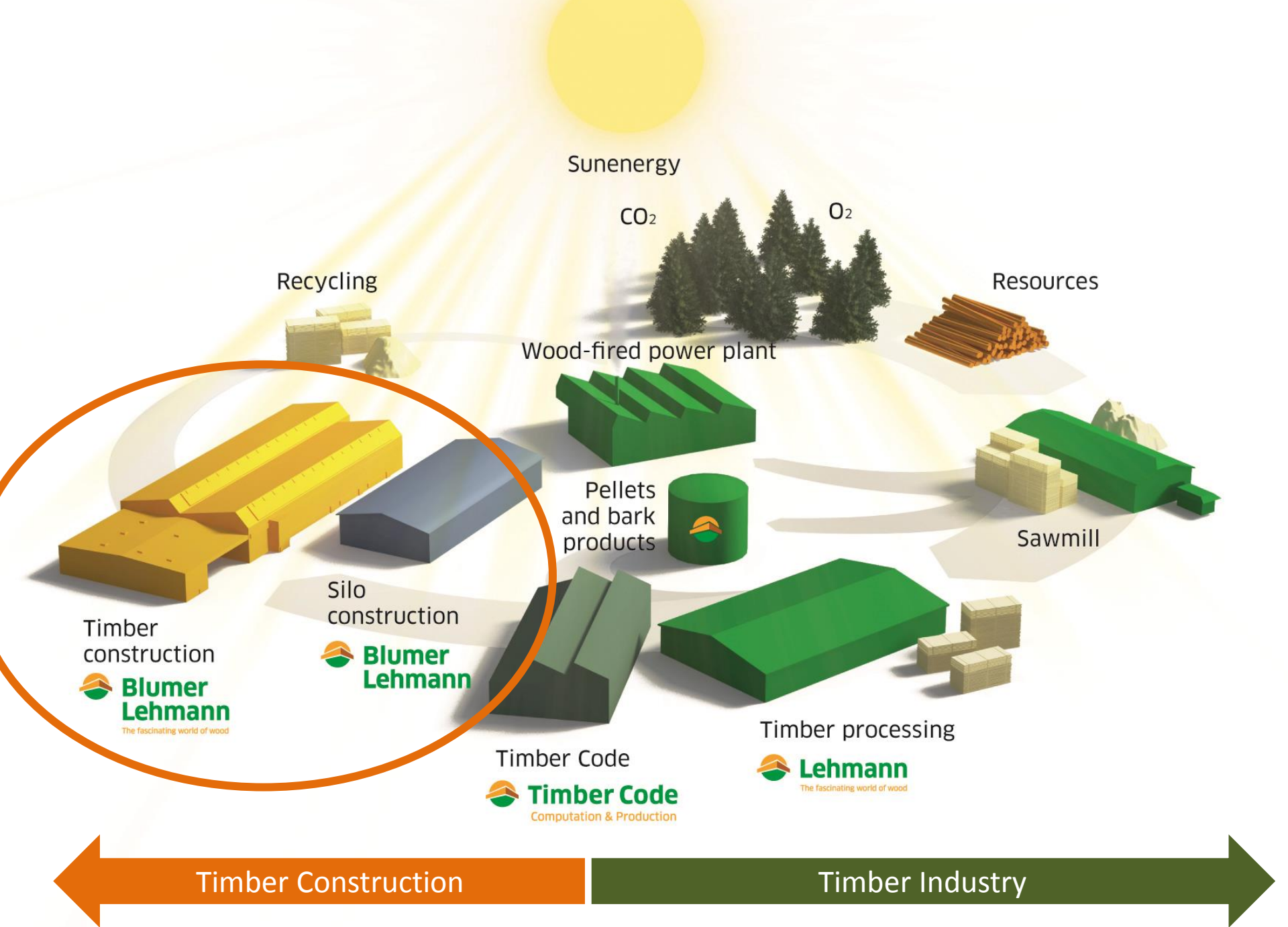


Question: Timber Industry
or construction company?

Thesis 4

«normal» building parts will be produced also from the idea to the machine – but differently

=> Different challenges!

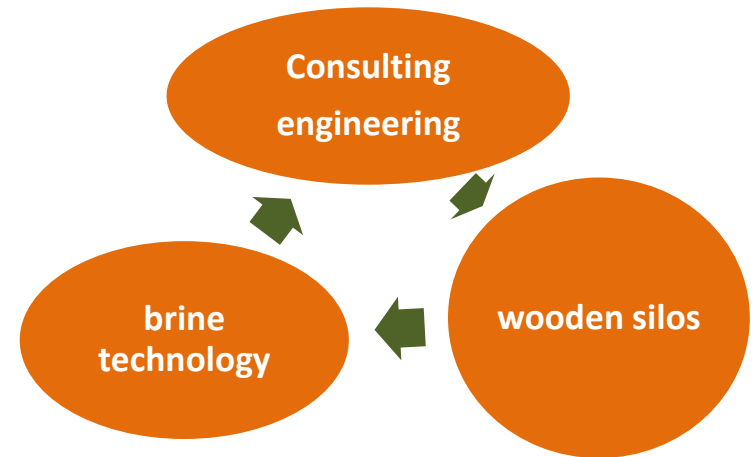




Construction: Silosystem construction



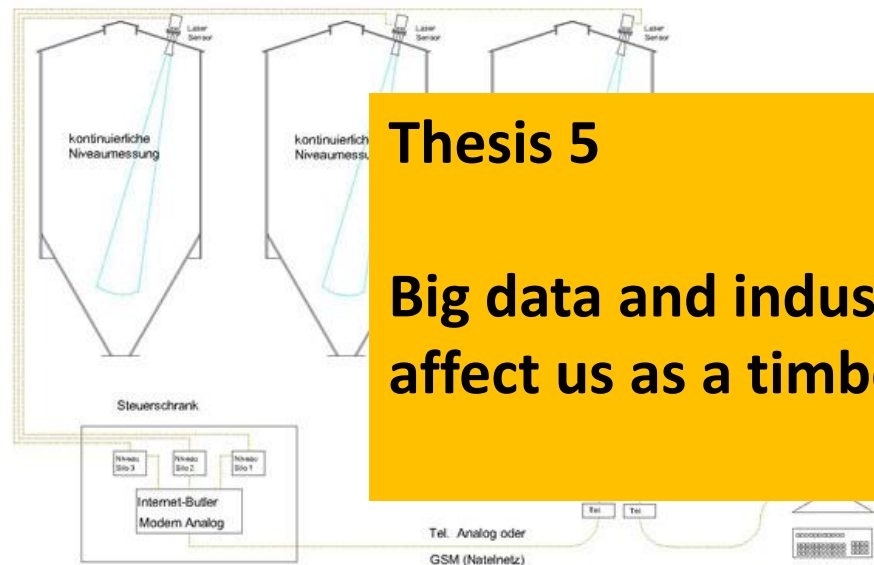
Small silos from 5 to 20 m³, wooden silos up to 1000m³, complete winter facilities, brine technology (brine producer and storage tanks), conveyor systems, technical equipment, service and maintenance





Aktuelle Themen Silobau

- Anlagentechnik
- Neue Nutzungsvarianten für «Holzbehälter»
- Steuerung und Überwachung der Anlagen inkl. Benutzeroberflächen/ Datenverfügbarkeit



Thesis 5

Big data and industry 5.0 will also affect us as a timber company

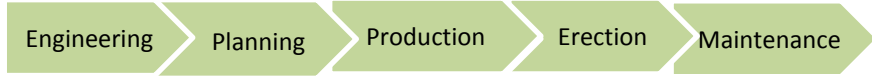
Thesis 3+4+5 (+6) as a conclusion and/or question:

Do we need other processes, skills, competences and a new way of thinking ?





Blumer-Lehmann AG



Modular buildings



**Blumer
Lehmann**
Faszination Holz

Freeforms

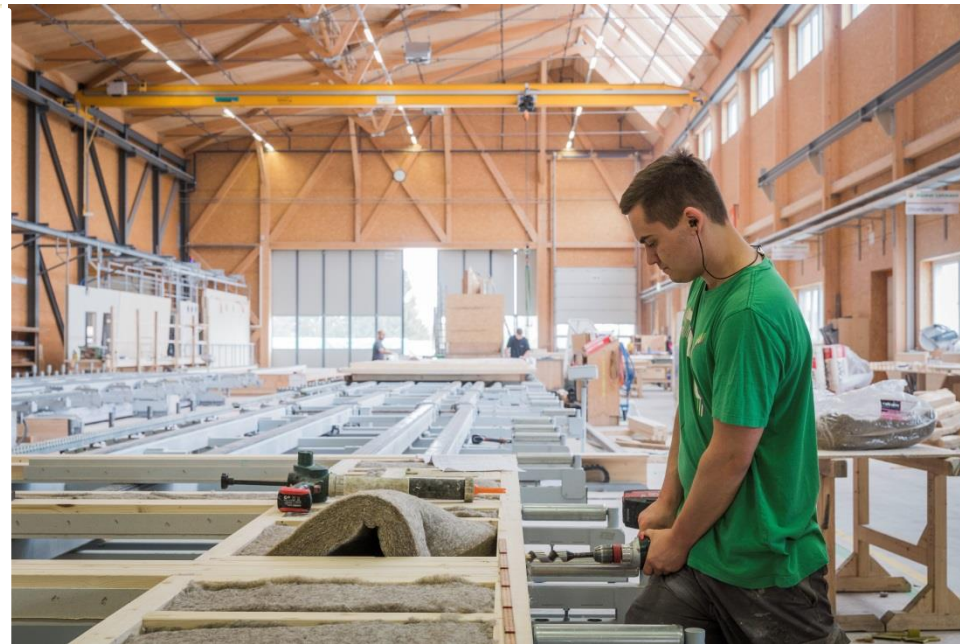
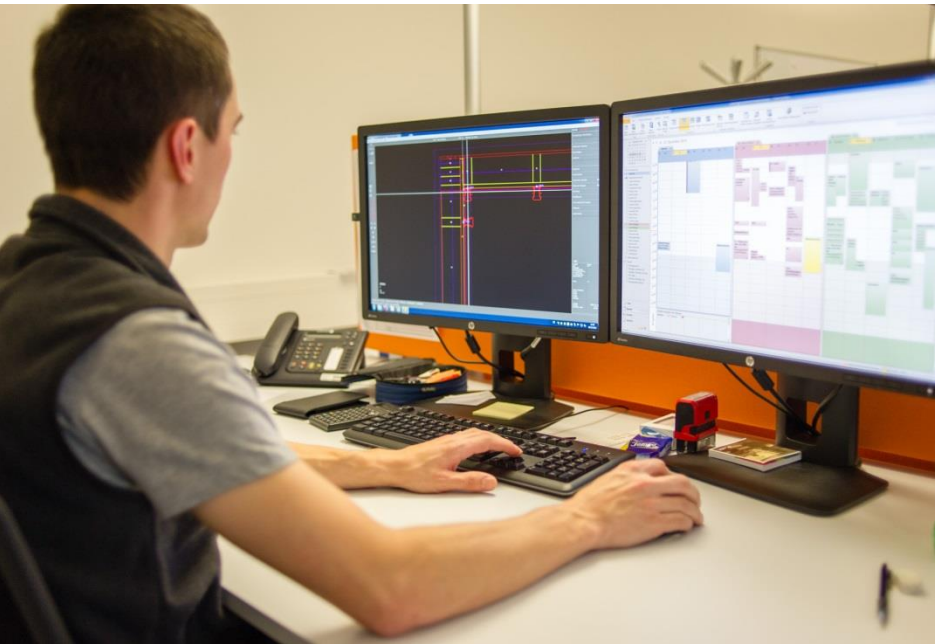
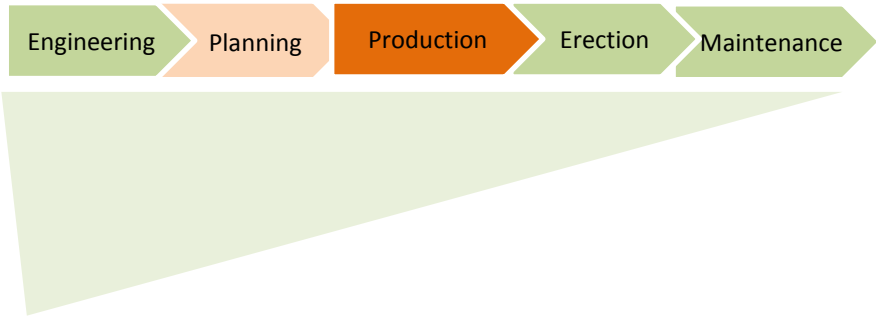


timber constructions





Prefabrication as a basic principle





Multi-storey apartment buildings

timber
constructions





Event structures – Temporary Buildings



- TIMBER -**
because of
- weight
 - speed
 - logistics
 - reliability
 - flexibility





Private Living – smart density



Special projects







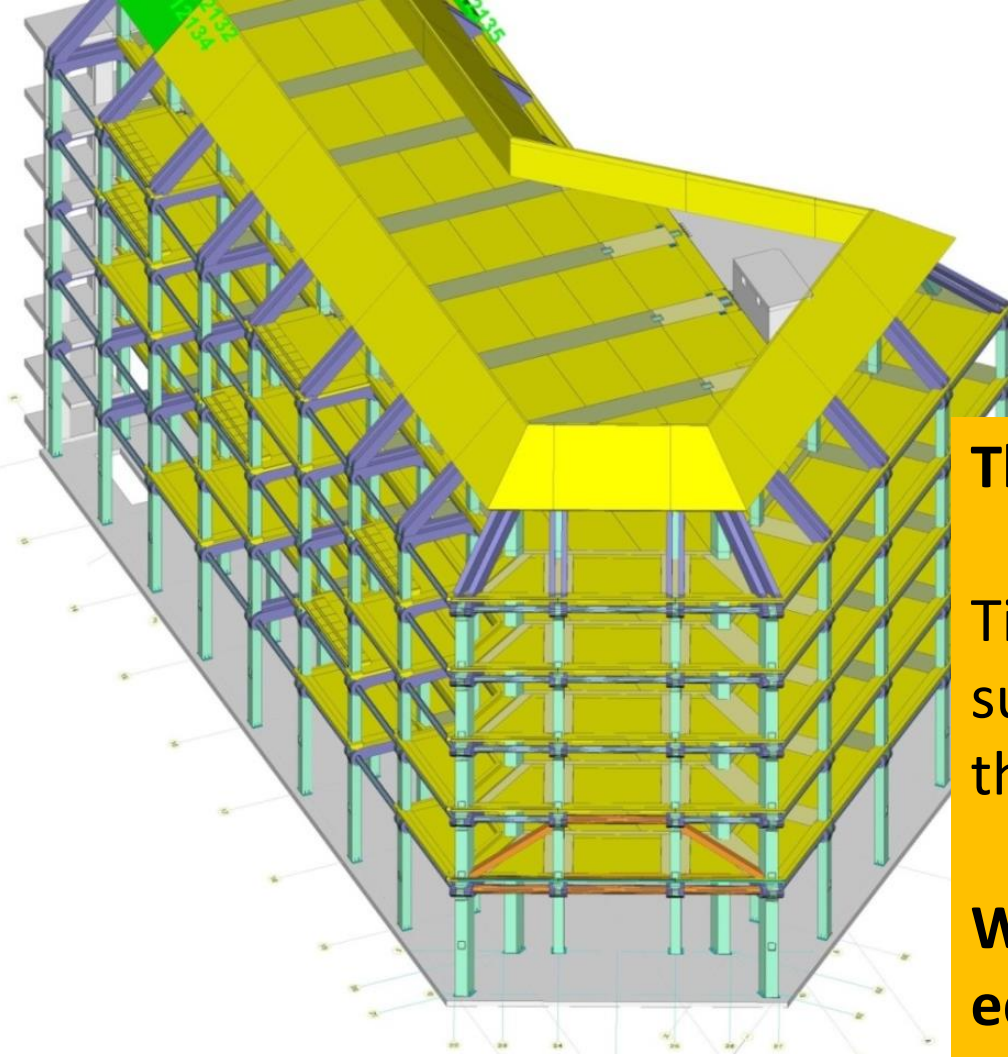


Topics for the future:

Nature in the cities – higher buildings



Why not in Switzerland??????



Thesis 6

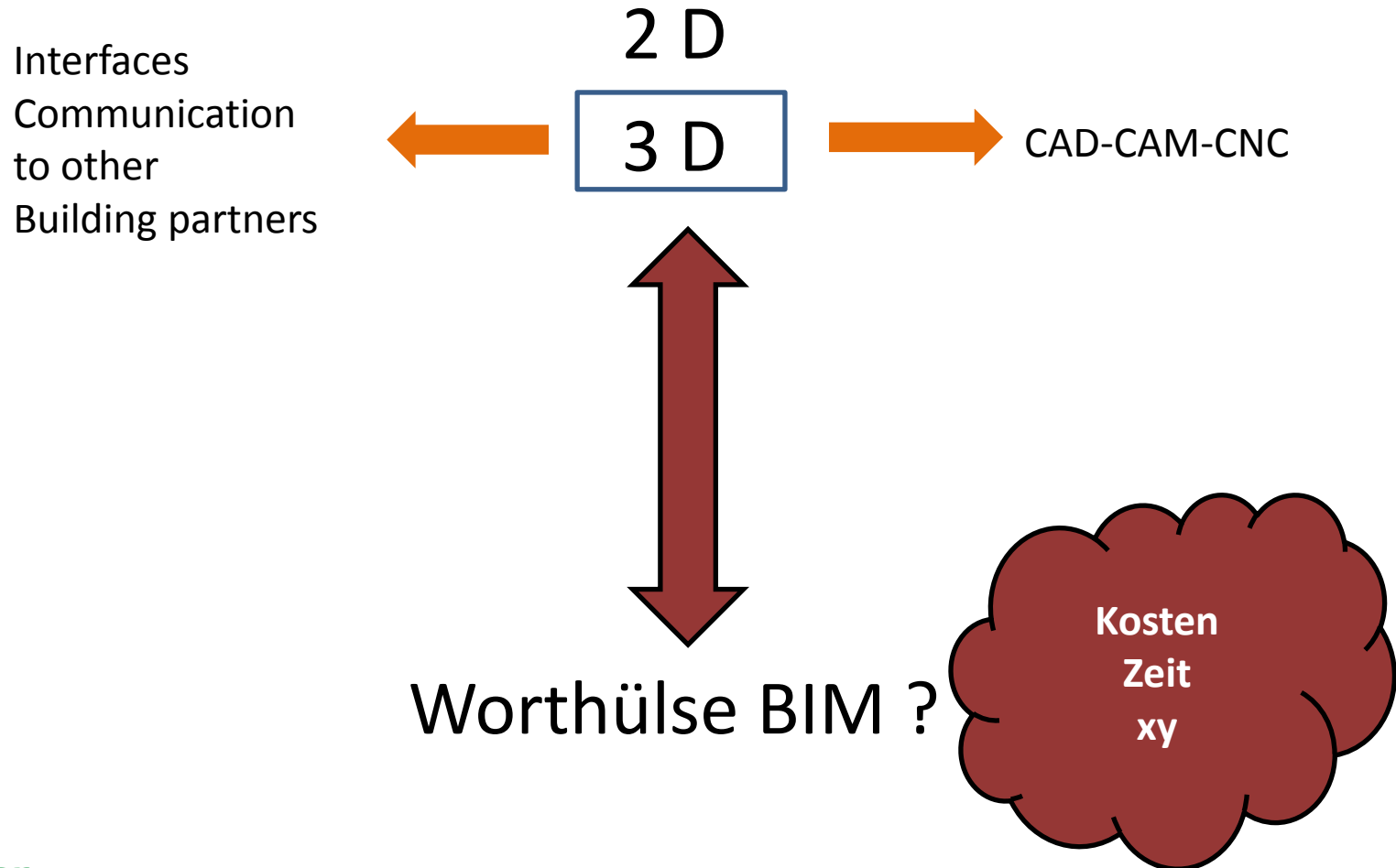
Timber constructions are trendy, sustainable and technically state of the art*

What will create new markets will equally be our way of planning and production in a new digital world

*among us: a few R&D fields are still left...

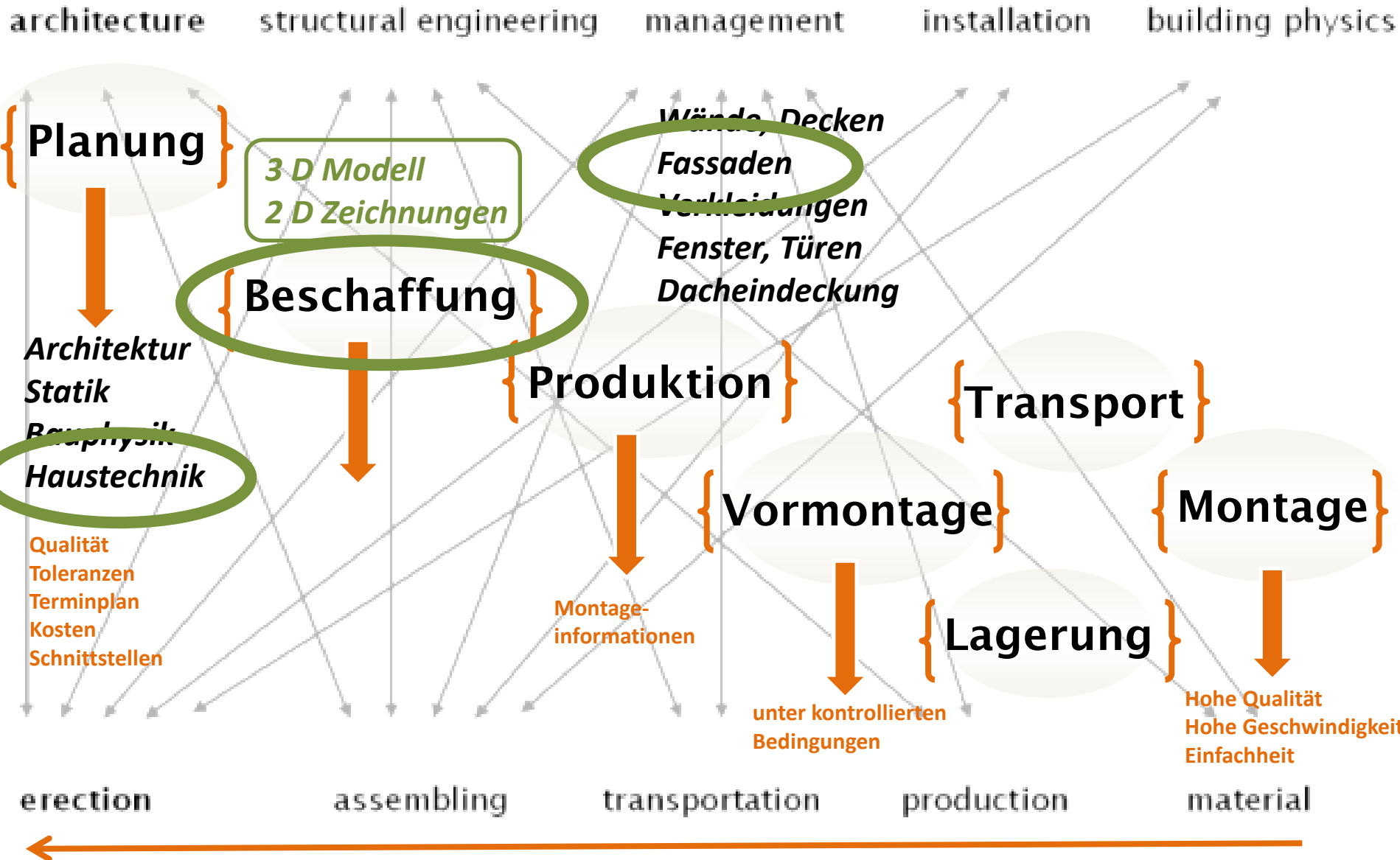


Complete 3 D Modeling





Prefabrication: cooperation & coordination





There is a lot of work to do till all involved partners will be ready for an integrated design to build process – or even a 3 D Model



Urban Constructions

Who is planning a facade today?



What about the facade?



There it comes:
Beech anchor bolt –
oval and absolutely precise

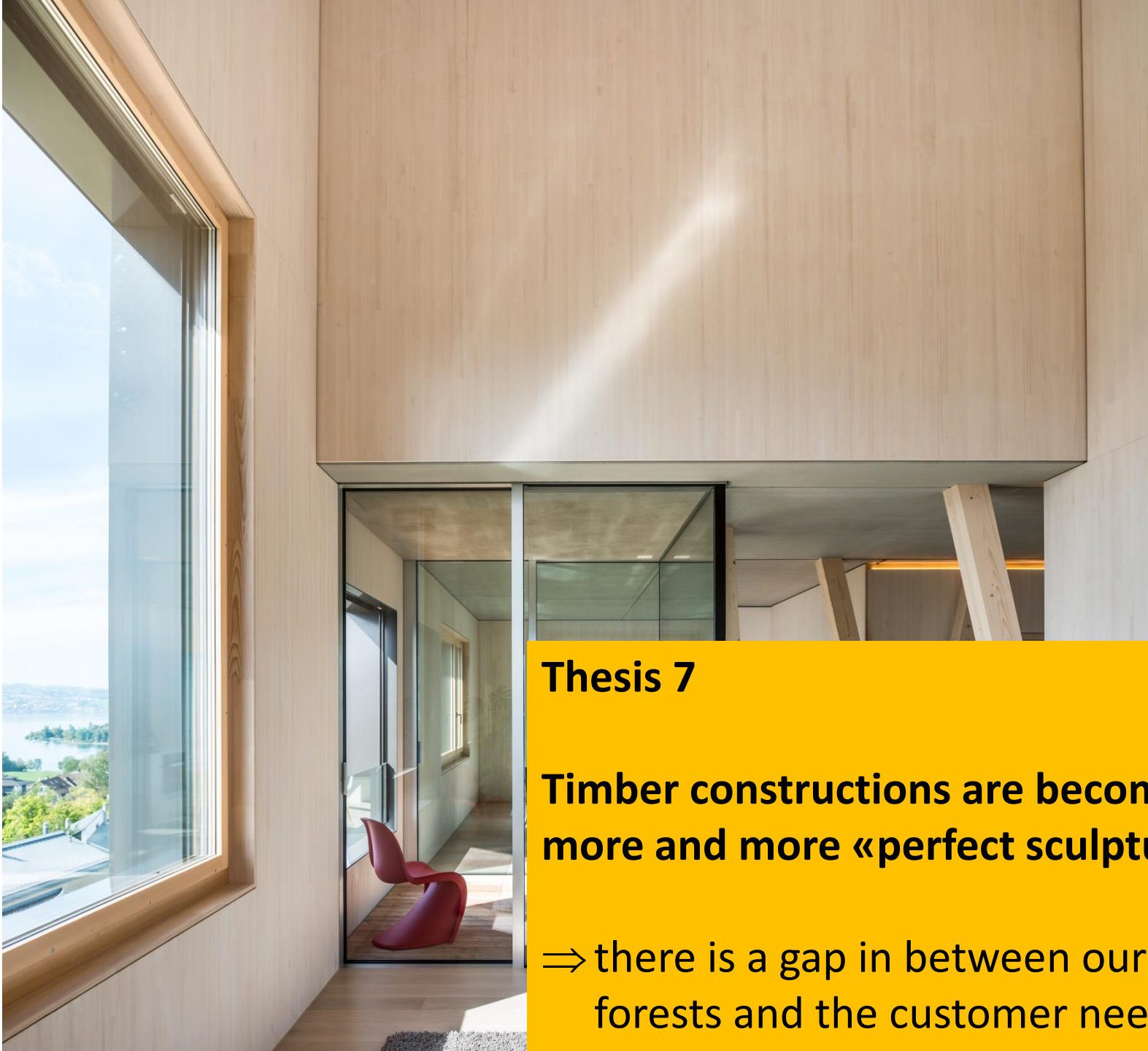




Why timber from Austria ?







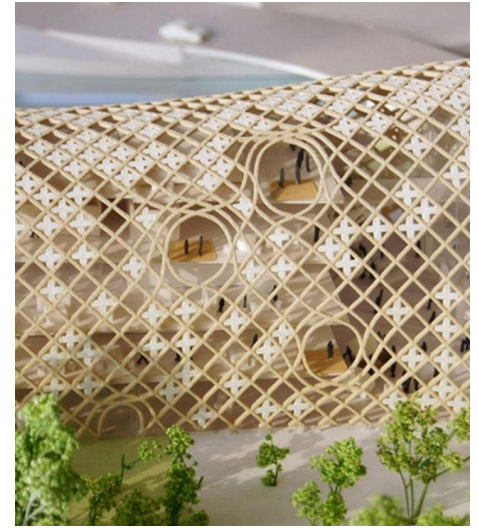
Thesis 7

Timber constructions are becoming more and more «perfect sculptures»

⇒ there is a gap in between our forests and the customer need



Structural architecture as a future topic?



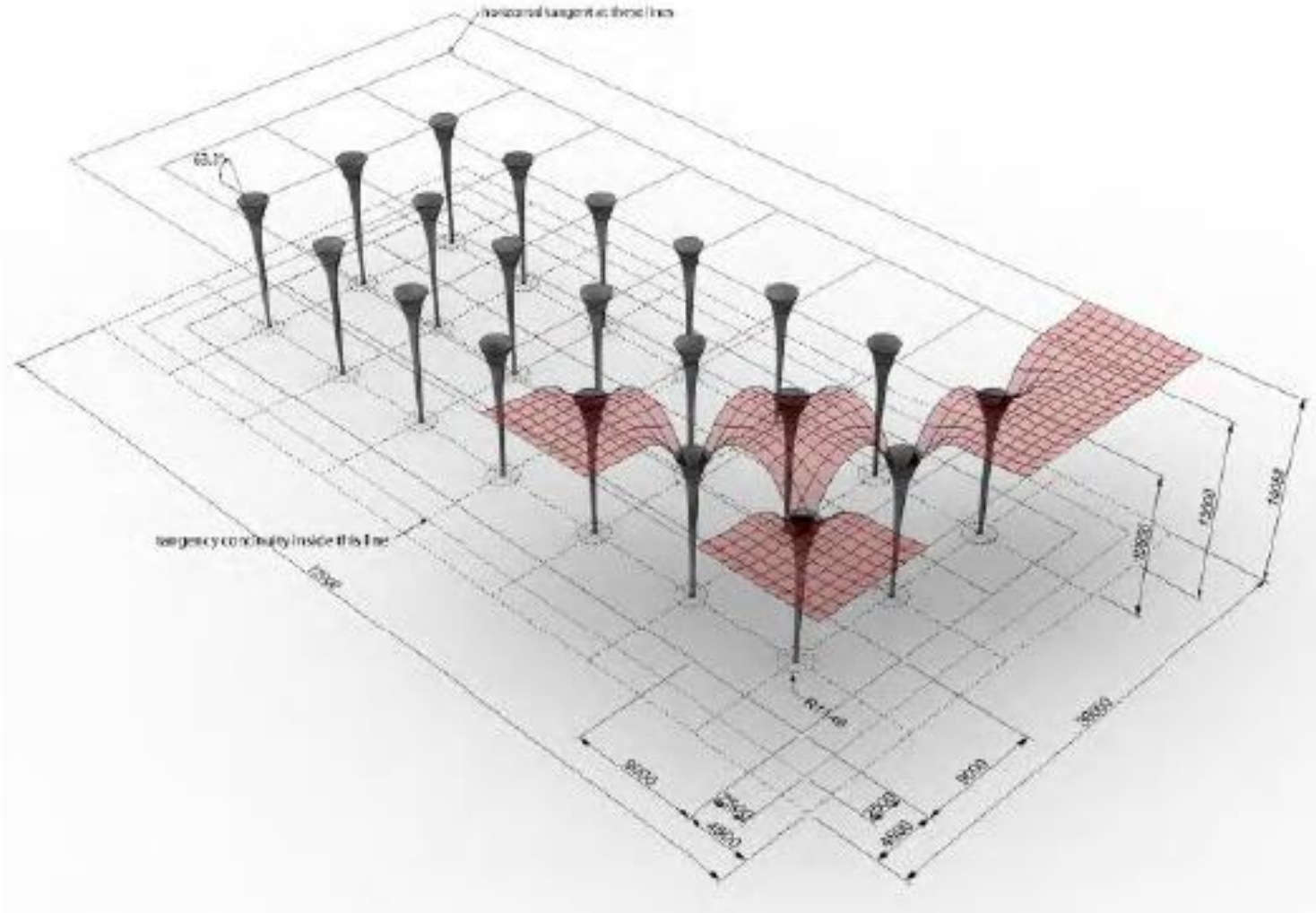
The construction:

- remains visible
- is the dominant factor of the architectural expression
- is mostly without any regularity
- is based on principles of nature
- is a perfect match for timber and its possibilities
- is a possibility to shift the image of timber constructions

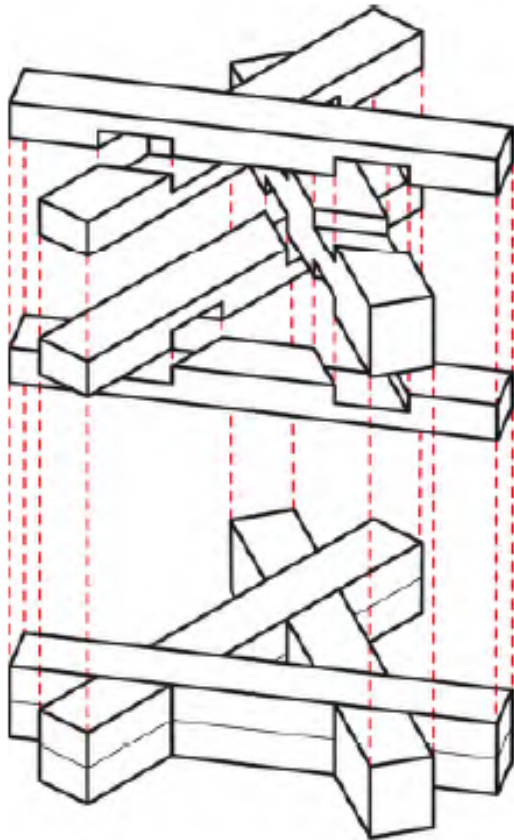
example: Yeosu Golf clubhouse, Southkorea



precise geometric description



15,000 joints = 1 detail



- free form:
lot size 1- every part is different
- timber:
details can be machined out of
the full material
- only if all follow the same rules:
efficient planning + production

→ parametric details

geometry → cnc-operations

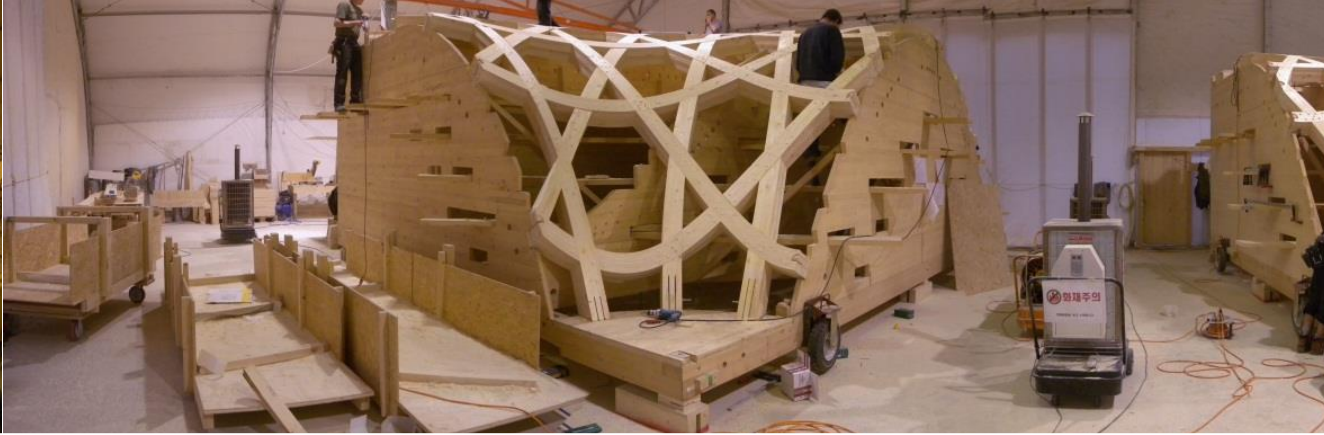
The screenshot displays a CNC control interface with a 3D model of a part being machined. The interface is divided into several sections:

- Top Panel:** Shows the current mode: **Fertigen** (Production), **Automatik** (Automatic), and **Aktiv** (Active).
- Parameter Table:** A table with columns for axis (X, Y, Z, B, A, X2, X3, X4), current value (Ist), and target value (Ziel).

	Ist	Ziel	Unit	Status
X	597.097	619.348	mm	○
Y	8.730	8.801	mm	○
Z	472.195	464.558	mm	○
B	192.589	192.568	Grad	○
A	-102.610	-102.715	Grad	○
X2	-789.617	-779.695	mm	○
X3	-2089.617	-2079.695	mm	○
X4	20000.000	20000.000	mm	○
- Control Panel:** Includes fields for **Drehzahl** (Spindle Speed) set to 3300, **Vorschub** (Feed Rate) set to 17918, and **Werkzeug** (Tool) set to WERKZEUG_WKZ_1.
- G-code Window:** Displays the active G-code program, starting with `N716 (GEAENDERT)` and `N718 G01 X00 Y07.3616 Z-15.8153 Z775.4`.
- 3D Model:** Shows a green 3D model of a part being machined by a tool. The part has a complex, curved shape. The tool is shown in a grey color, and the workpiece is on a blue grid.

digitally controlled fabrication





Controlled connections on site
Glued – mechanical – others?



Automatic Cutting / Manual Assembly



Controlled connections on site
Glued – mechanical => others?



erection

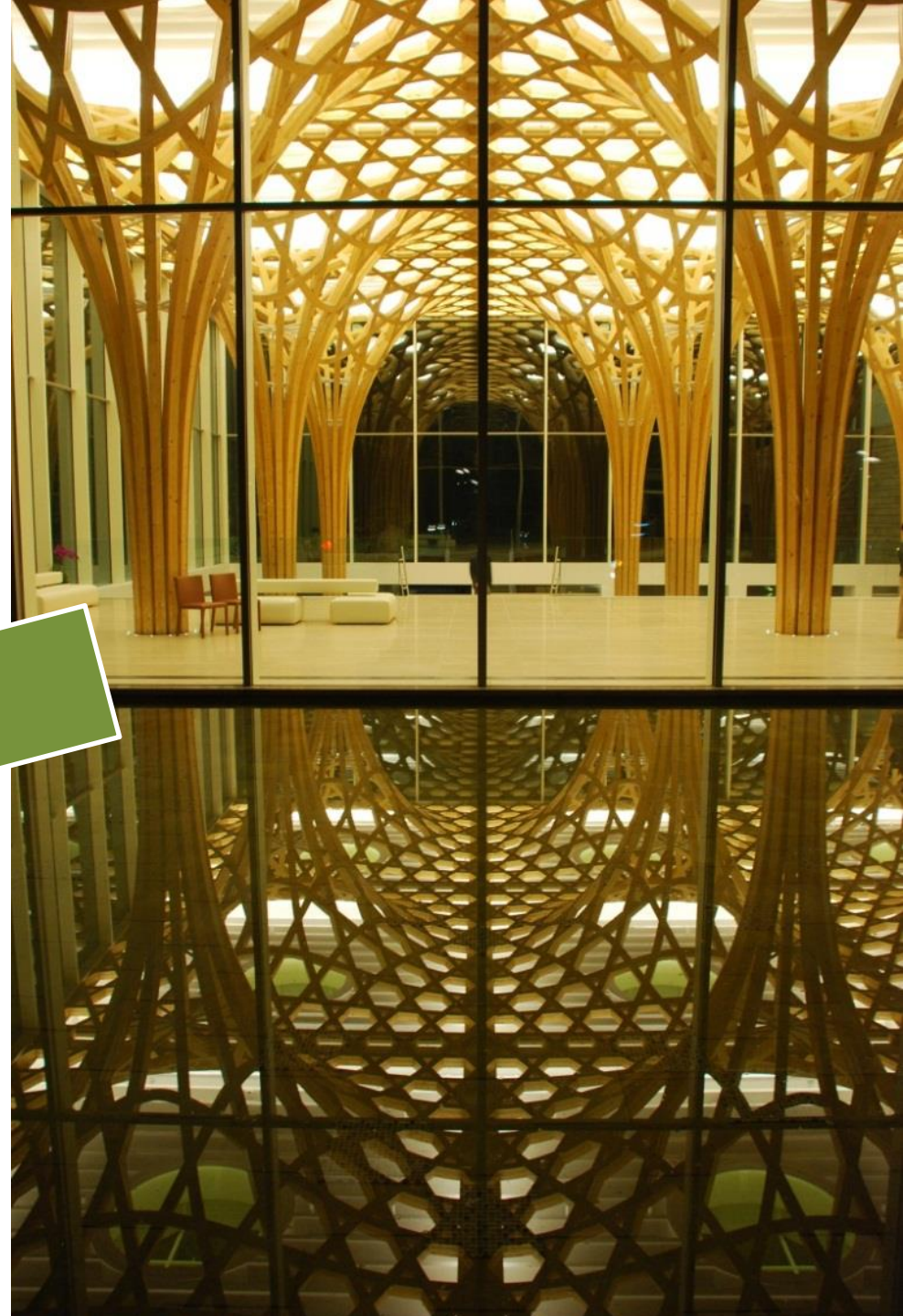






Natural Hightech

Treatment?





Shah Mosque, Isfahan

In 1598, Shah Abbas moved the Persian capital to Isfahan. Here, he commissioned a remarkable sequence of ambitious and beautiful religious and civic buildings. But, because the only readily available building material in Isfahan was baked mud brick, there was a fear that, however grand, the new buildings would look rather dull. New techniques in firing coloured mosaic tiles, however, allowed the Shah's architects to revel in wondrous displays of decoration, brought to perfection here in the Shah Mosque (1612-38). Designed by the master calligrapher and miniaturist Rezza Abbasi, the blue, yellow, turquoise, pink and green tiles catch and reflect the light of this bright and hot city, animating cool spaces under the great blue dome of Abbas's mosque. (Credit: Hossein Lohinejadian / Alamy Stock Photo)



BBC The 10 most beautiful ceilings of the world

Haesley Nine Bridges Golf Club House, Yeosu-gun, South Korea

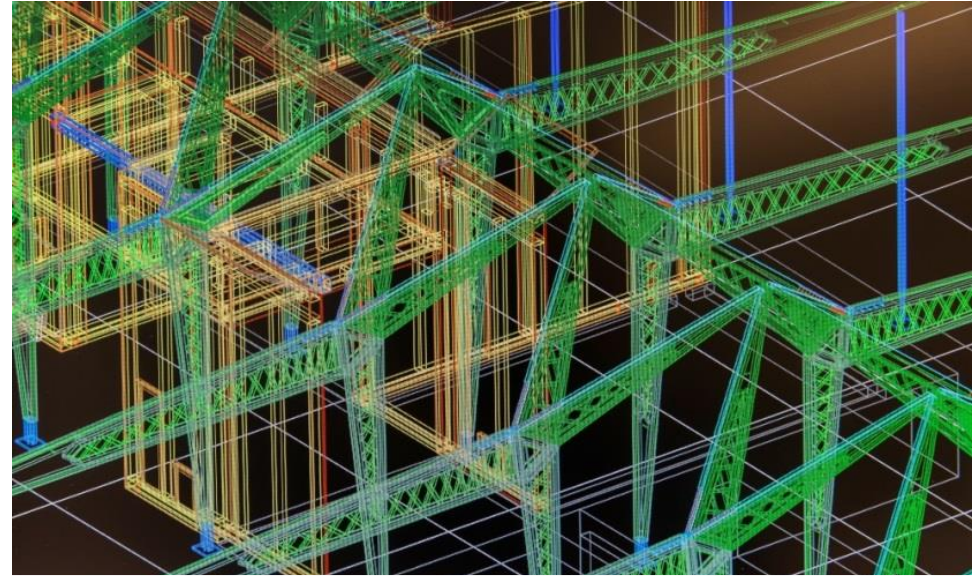


Thesis 8

**Ambitious and skilled
architects & engineers are
a precondition for innovative
timber constructions**



Maggies Center, Manchester, Foster & Partner





What makes a Maggie's building?

- Architectural flair**
 - Craftsmanship**
 - Going the extra mile**
 - Making the designers think**
 - Passion**
 - Allow scope for the brainwave**
- Dialogue and partnership**

Was leisten wir in Bezug auf die
Ausbildung der Architekten ?

NORMAN FOSTER
22. APRIL 2015

Omega 1 & 2, Biel, Switzerland

Shigeru Ban architects



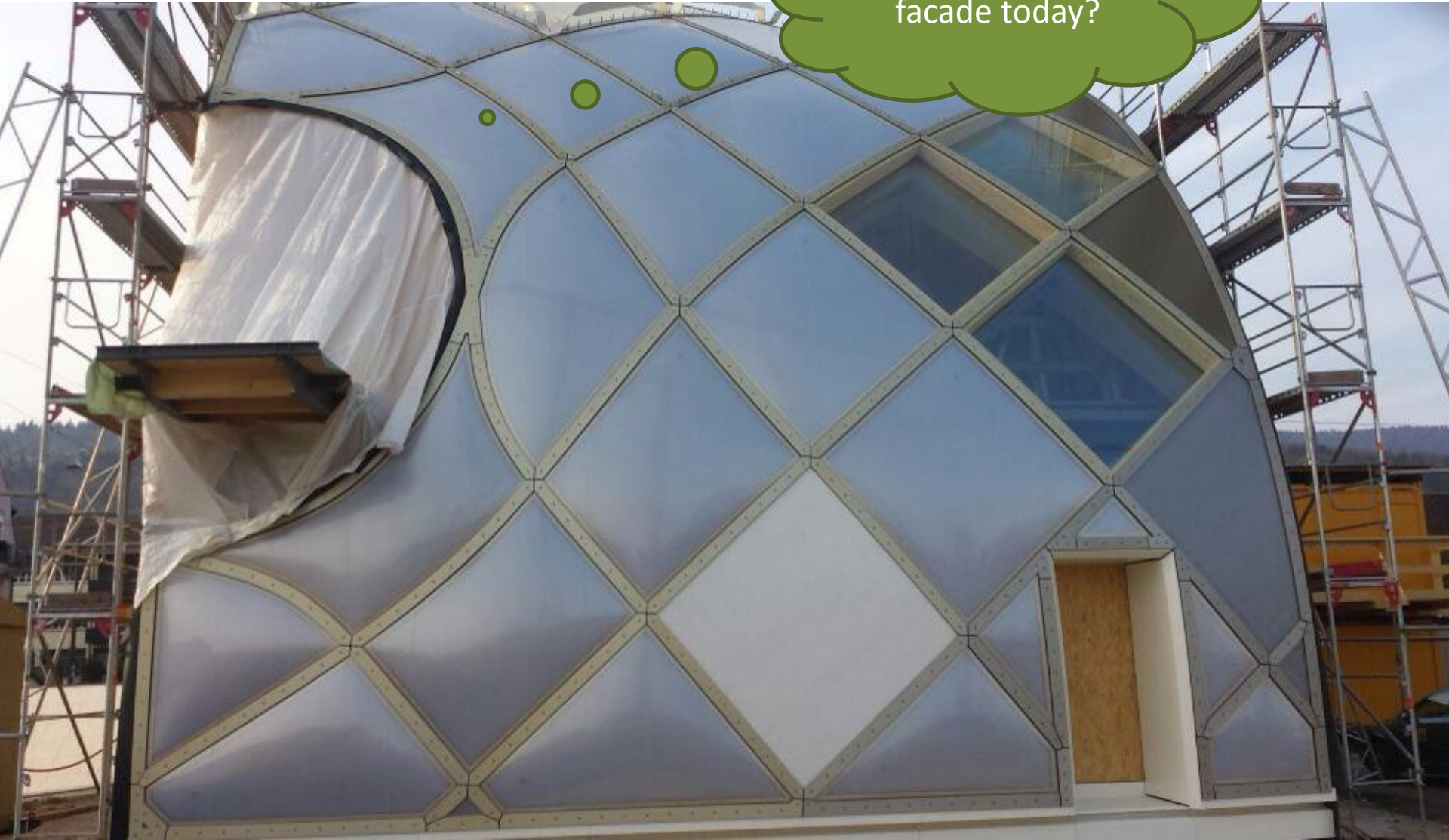
Here it comes:
Beech – where
it is needed!
And without
R&D money





... and the covering ??????????

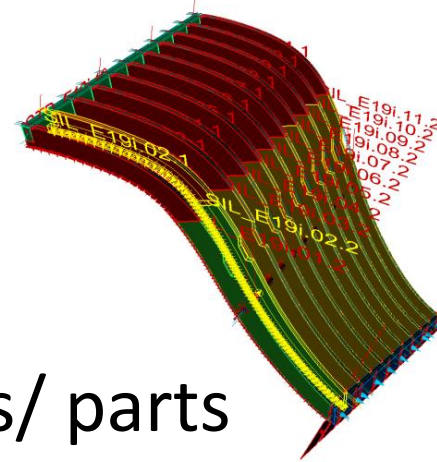
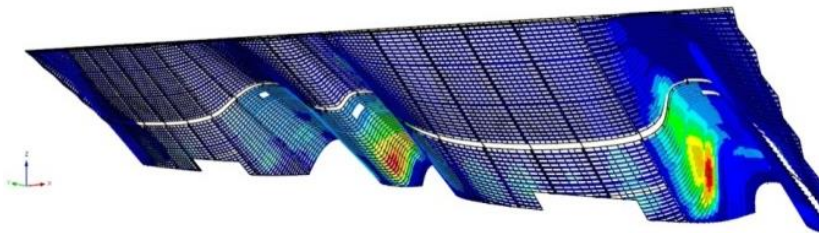
Who is planning a facade today?



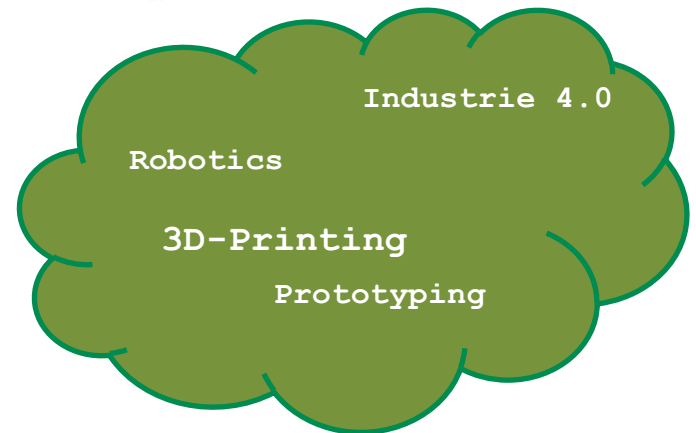


As a summary: It's all digital

Timber construction engineers develop data ...



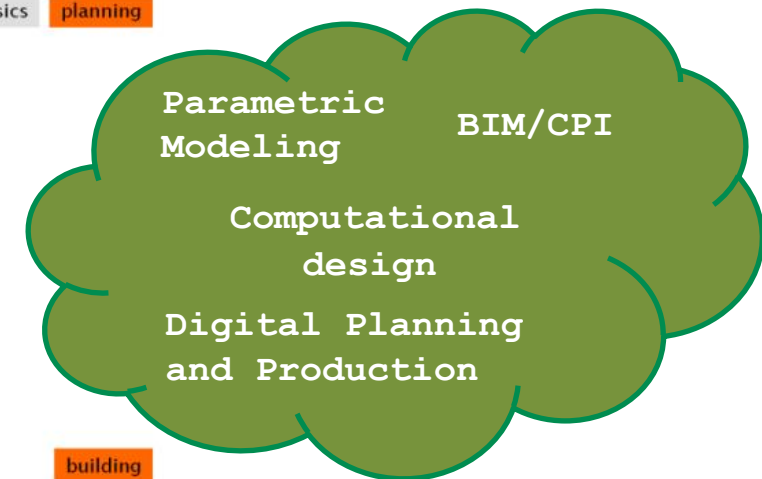
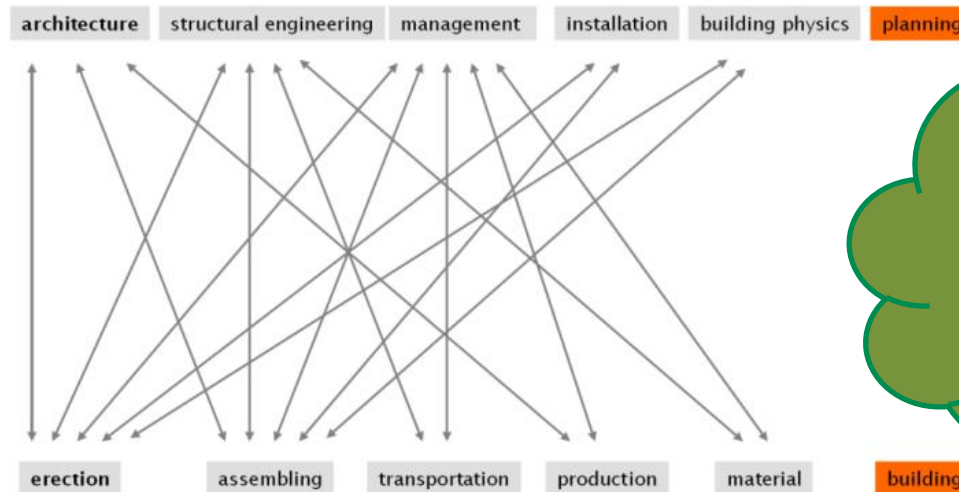
...and produce forms/ shapes/ parts





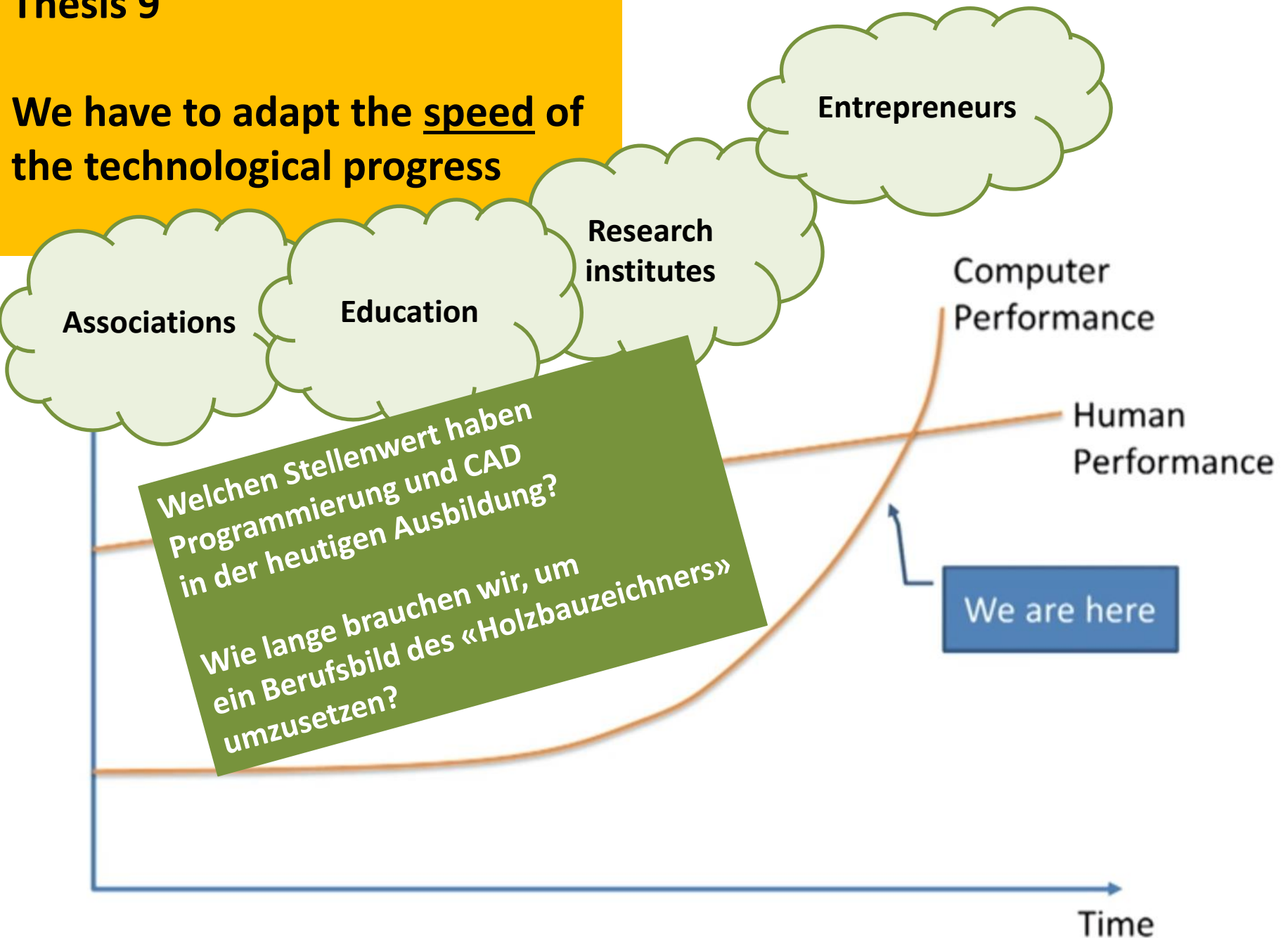
It's all digital 2

- Implemented digital chain => network
- Production companies are becoming IT specialists, providing services and are solving interfaces
- **Carpenters coordinate building processes**



Thesis 9

We have to adapt the speed of the technological progress



New skills and tasks

Other education

Problem solvers

GENERATION

Networkers

Thesis 10

We need a generation WOOD

⇒ THE HUMAN FACTOR AS INSPIRATION
BUT ALSO AS CHALLENGE

NET GENERATION

PLURALIST

CONNECT

SENGING

DIGITAL NAT

CIRCLES

GEEKS

ORIENTED

ECONOMIC D

HION

ONLINE PRESENCE

MULTI-TASK

INSECURITY / TOLERANCE / GLOBAL

EVEN BEING 141 YEARS OLD: WE ARE FLEXIBLE, DYNAMIC AND FULL OF INNOVATIVE IDEAS



Dank der industriellen und leistungsfähigen Infrastruktur des Sägewerkes und der Schnittholz-Weiterverarbeitung können wir individuelle Wünsche in kürzester Zeit erfüllen.



Holzbauten werden individuell geplant und industriell vorgefertigt, so dass die Bauzeit auf der Baustelle möglichst kurz ist.



In unserer Modulproduktion fertigen wir rund 250 Raumzellen pro Jahr. Schnell, flexibel und bezugsbereit ausgeliefert.



Innovation bedeutet für uns gute Ideen, aber auch die Umsetzung dieser Ideen zu stetig verbesserten Produkten, Leistungen, neuen Holz-Anwendungen und höheren Kundennutzen.



Wir kombinieren den traditionellen Werk- und Baustoff Holz mit der Formsprache hochstehender Architektur und moderner Technologie – das sorgt für Begeisterung im In- und Ausland.



Dank unserem Know-how und unseren modernen Anlagen können wir beinahe jeden Wunsch erfüllen. Gerade oder gekrümmt, einfach oder komplex, glatt oder strukturiert – das Design gibt die Aufgabe vor.



Regional, schweizweit oder international. Unsere Montage-Fachleute montieren Holzkonstruktionen mit Können, Erfahrung und Leidenschaft.



So wie der Holzbau in neue Dimensionen vorgestossen ist, sind unsere Projekte auch internationaler geworden: was gleich geblieben ist, ist die Schweizer Qualität und unser Berufsstolz.



Unsere Service- und Unterhaltsteam betreiben die Gebäude und Silos auch nach der Fertigstellung und sichern damit zu jedem Zeitpunkt die Qualität und Funktion der Anlagen.



Für die Planung und Projektentwicklung nutzen wir modernste IT-Lösungen. Wir programmieren durchgängige Prozesse, automatisieren damit die Leistungserbringung und sorgen für funktionierende Schnittstellen und Verbindungen.



Unsere Mitarbeitenden bleiben am Ball. Handwerk bleibt im Holzbau ein zentrales Element. Dazu kommen der Umgang mit neuen Technologien, leistungsfähige Maschinen und moderne CNC-Bearbeitung für eine flexible Produktion.



Sowohl in der Planung, Produktion als auch während der Montage sind kreative Lösungen gefordert. Oft geben auch innovative Logistiklösungen den Takt vor, so dass die Abläufe auf der Baustelle optimiert werden können.

WE ARE CONSCIOUS, WORK SUSTAINABLE AND ACT LIKE A FAMILY – NOT ONLY WITH OUR TEAM, BUT ALSO WITH OUR PARTNERS



Bei uns wird das Handwerk gepflegt. Treppen-, Um- und Anbauten oder Speziallösungen, die das Know-how unserer Fachleute erfordern, begeistern uns.



Das Beschreiten von neuen Wegen erfordert eine strikte Risikokontrolle. Deshalb werden bei jedem Prozessschritt die Qualität überwacht, dokumentiert und damit Fehler vermieden.



Wir legen grossen Wert auf langjährige Partnerschaften mit unseren lokalen Rundholzlieferanten, den Zulieferbetrieben und all unseren Partnern.



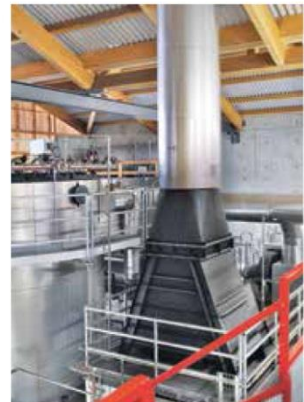
Hinter all unseren Aktivitäten stehen die Faszination Holz, unsere Begeisterung für traditionelles Handwerk und Brauchtum gleichermaßen wie für fortschrittliche Technologie.



Für die Umsetzung von guten Ideen braucht es eine ungezwungene Arbeitsumgebung und Freude an der Arbeit.



Wir pflegen den persönlichen, fairen und partnerschaftlichen Umgang untereinander und mit allen Anspruchsgruppen. Heute, gestern und morgen.



Im Erlenhof gibt es keine Holz-Abfälle. Was nicht als Werk- und Baustoff verwendet werden kann, wird zu CO₂-neutralen Brennstoffen und am Ende zu Wärme und Strom.



Wir produzieren aus dem Restholz gleich viel Energie, wie wir pro Jahr im Erlenhof verbrauchen. Damit arbeiten wir energieautark, klimaneutral und ressourcenschonend.



Wir leben Nachhaltigkeit. Nicht nur im ökologischen Sinn. Wir bilden Lernende aus, bieten attraktive Arbeitsplätze, engagieren uns vielseitig und wollen auch wirtschaftlich bleibende Werte schaffen.



Jedes Jahr dürfen wir zahlreiche neue Berufsleute bei uns begrüßen und zu Holzspezialisten ausbilden. Wir freuen uns sehr, dass wir immer wieder junge Leute für unseren Bau- und Werkstoff begeistern dürfen.



Unsere pensionierten Mitarbeitenden bleiben uns wichtig. Auch sie haben uns zu dem gemacht, was wir heute sind und wir dürfen auf deren langjährige Erfahrungen zählen.



Wir sind ein Familienunternehmen in der 5. Generation. Wandel ist und war während den vergangenen 140 Jahren unser steter Begleiter. Was jedoch Bestand hat, ist die familiäre und partnerschaftliche Kultur.



As a summary:

There is still a long and challenging way to go

TIMBER IS WORTH IT!



BECAUSE IT'S NATURAL HIGHTECH

Timber constructions in terms of sustainability and technological possibilities, clearly represents the future of the construction industry.