



Innovation in Metallurgical Production

Introduction



- 1 Teaching methods & final examination
- 2 Programme of the course
- 3 References
- 4 Thesis & Stages
- 5 Scenario
- 6 Objectives
- 7 Contacts



- *Active Lectures* (in English)

Monday: 8.30-10.00 - Room VM19

Thursday: 12.30-14.00 - Room VM19

- *Active class at industrial plants*



- Zoom meeting: Summary of lectures / Forum / Questions (English/Italian)
by appointment (<https://unipd.zoom.us/j/4137633677>)

- *Examination* (in Italian or English as preferred)

Oral sessions: Jan-Feb / Jun-July / Sept



Video and audio registrations of lectures can be viewed at:

<https://stem.elearning.unipd.it>

Unipd | Portale Didattica | Orari | Uniweb | Webmail | Italiano (it) ▾



1222-2022
ANNI

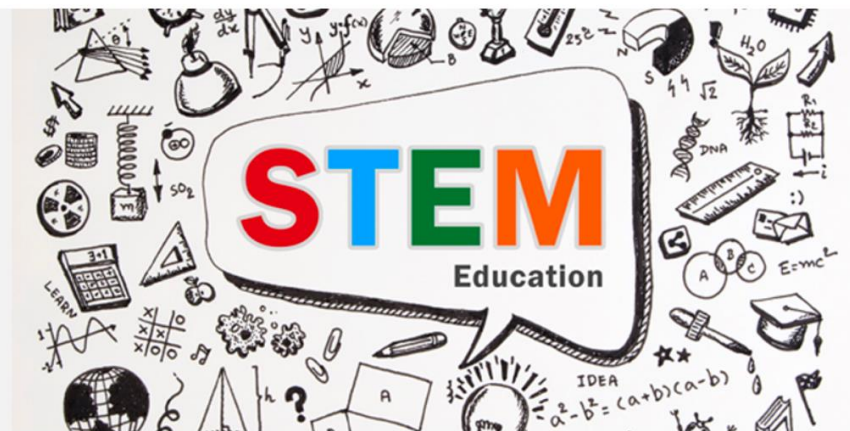


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DEGLI STUDI
DI PADOVA

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Macroarea STEM

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piattaforma Moodle!



Password: IMP2022



IMP - Programme

1

Material, Design & Properties

The optimization cycle, Material-Process-Design, The obsolescence of Materials and Technology

Material selection

2

Criteria for material & process selection

Materials, Processes and their attributes, Materials Properties Chart, Material Indices

3

Steel production & transformation

From Blast Furnace to ULCOS Project, from traditional EAF to Siemens Innovations, twin-roll casting & horizontal continuous casting

Steelmaking





Foundry industry

4

Innovative Foundry Processes

Ablation technology, HQcast, SSR, SLC, RSF, MCcast, Squeeze casting, Counter pressure processes

5

Innovative Al foundry alloys

Ductile alloys for safety & structural components, impurities and trace elements, Rheinfelden, Hydro, Alcan alloys, The die life



Date	Topic
Mon 03-Oct	Introduction
Thur 06-Oct	Material, Design and Properties
Mon 10-Oct	Material, Design and Properties
Thur 13-Oct	The design process for material selection
Mon 17-Oct	The material index
Mon 24-Oct	The design process for process selection
Thur 27-Oct	Steel production and transformation
Thur 03-Nov	Direct reduction route for steel production
Mon 07-Nov	Primary steel route production
Thur 10-Nov	Primary steel route production
Mon 14-Nov	Secondary steel route production
Thur 17-Nov	Secondary steel route production



Date	Topic
Mon 21-Nov	Refining processes of steel
Thur 24-Nov	Casting operations of steel
Mon 28-Nov	Casting operations of steel
Thur 01-Dec	Innovative aluminium foundry alloys
Mon 05-Dec	Innovative aluminium foundry alloys
Mon 12-Dec	Conventional foundry processes
Thur 15-Dec	Innovative foundry processes
Mon 19-Dec	Innovative foundry processes
Tues 20-Dec	Visit at Siderforgerossi Group SpA
Thur 22-Dec	Concluding remarks



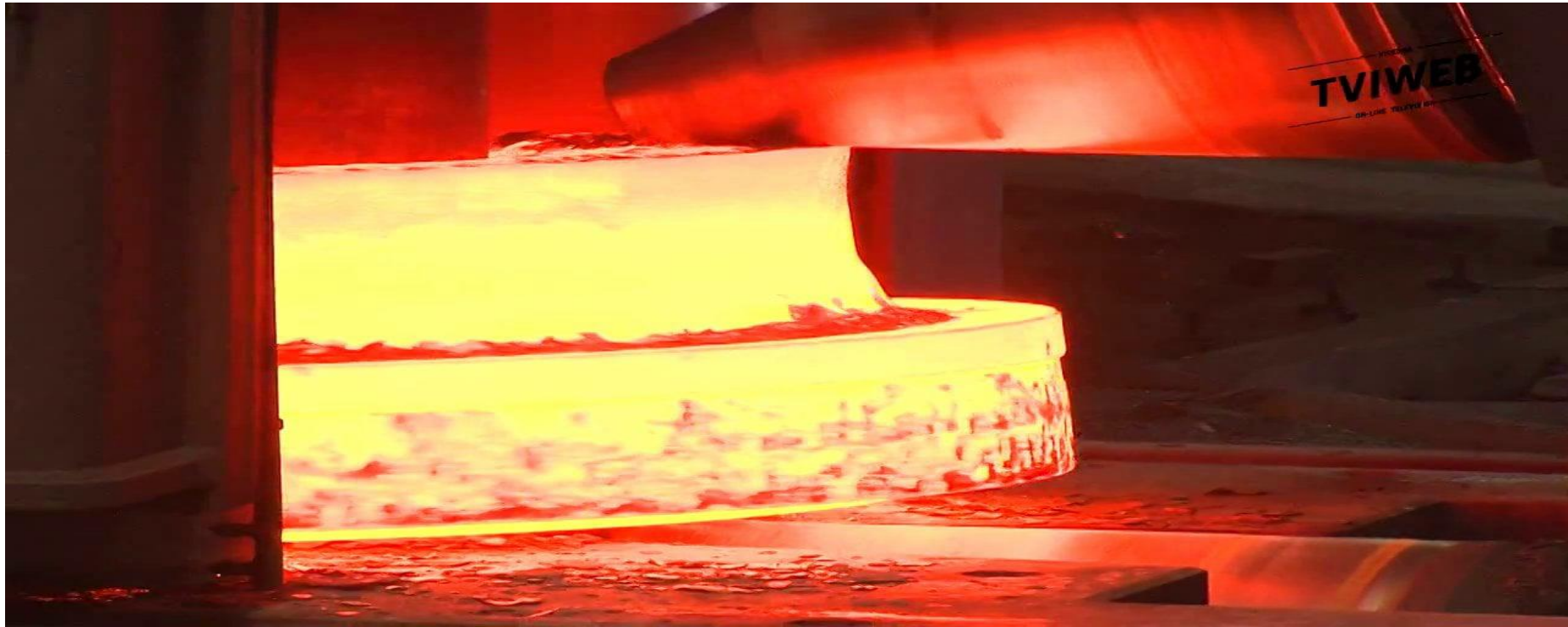
Via Cartiera di Mezzo, 38
36011 Arsiero (VI)

www.siderforgerossi.com

Visita aziendale: 20/12/2022

Durata visita: 14.30 – 18.00

Meeting point: v.le Stadio, Vicenza
(fermata autobus) ore 13.00





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36011 Arsiero (VI)

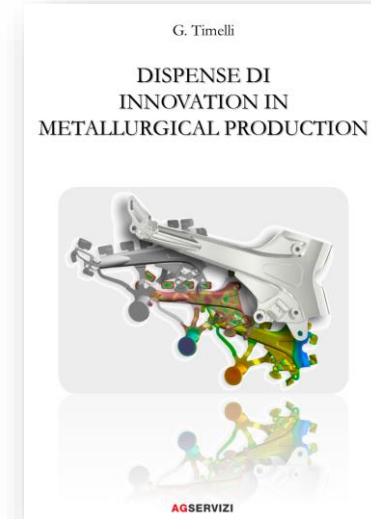
www.siderforgerossi.com





Reference Book

- G. Timelli
Innovation in Metallurgical Production,
Ed. AG-Servizi, Vicenza, 2019



Other Books/websites:

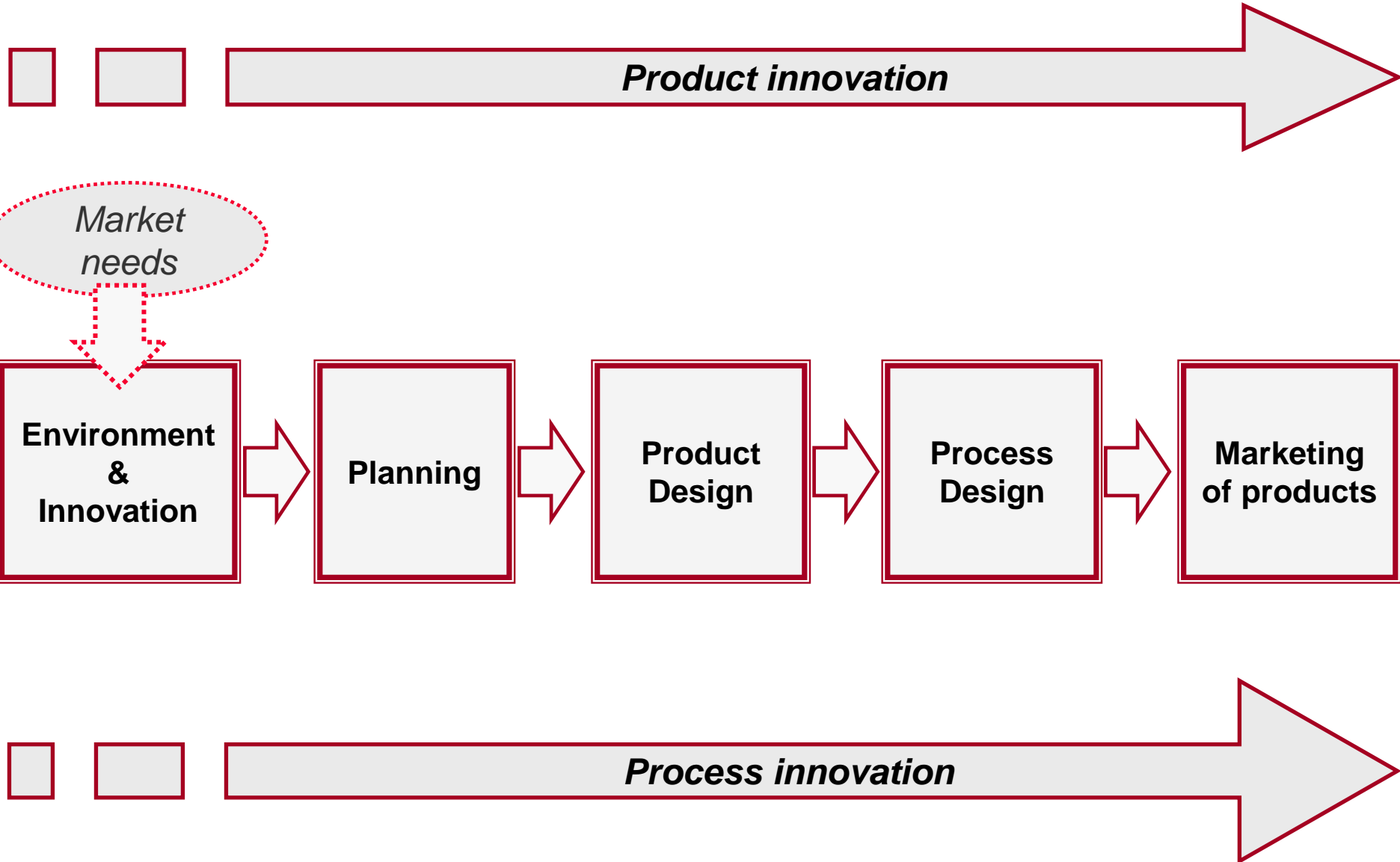
- M.F. Ashby
Materials selection in mechanical design, Butterworth-Heinemann, 2005
- <http://www.ulcos.org>
- World Auto Steel, Advanced high strength steel (AHSS) - Application guidelines, ver. 4.1, Online at: www.worldautosteel.org
- E.J. Vinarcik
High Integrity Die Casting Processes, John Wiley & Sons, 2003
- <http://steeluniversity.org>

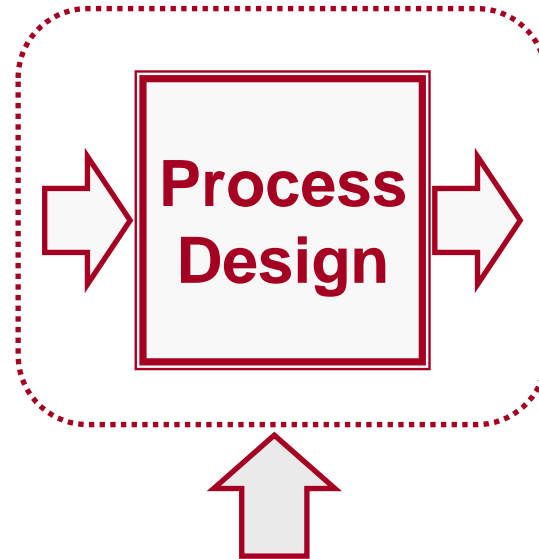


- Inside the projects with Italian or EU companies
- Inside Italian or EU projects
- Inside DTG laboratories
- Inside the projects with EU, US Universities
- Inside Erasmus projects
- Inside Erasmus +
- ...

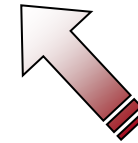
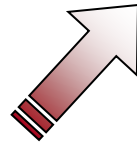


1. Ottimizzazione del processo produttivo di leghe primarie d'alluminio (*Azienda, Sunndalsøra - Norway*)
2. Assessment the recyclability of complex aluminum scraps (*Azienda/Università - Norway*)
3. Correlazione tra processo fusorio e qualità in leghe leggere (*Azienda, Essen - Germany*)
4. Leghe innovative secondarie per sistemi frenanti (*Azienda/Università, Sweden*)
5. Sviluppo di trattamenti termochimici per dischi freno per applicazioni racing (*Azienda/Università, Mapello - BG*)
6. Sviluppo e ottimizzazione di leghe innovative per ruote in lega leggera per applicazioni racing (*Azienda, Palosco - BG*)
7. Minimizzazione di difetti da riempimento nella produzione di componenti automotive colati in LPPM (*Azienda, Dello - BS*)
8. Ottimizzazione dei trattamenti di inoculazione per ruote in lega leggera (*Azienda, Dello - BS*)





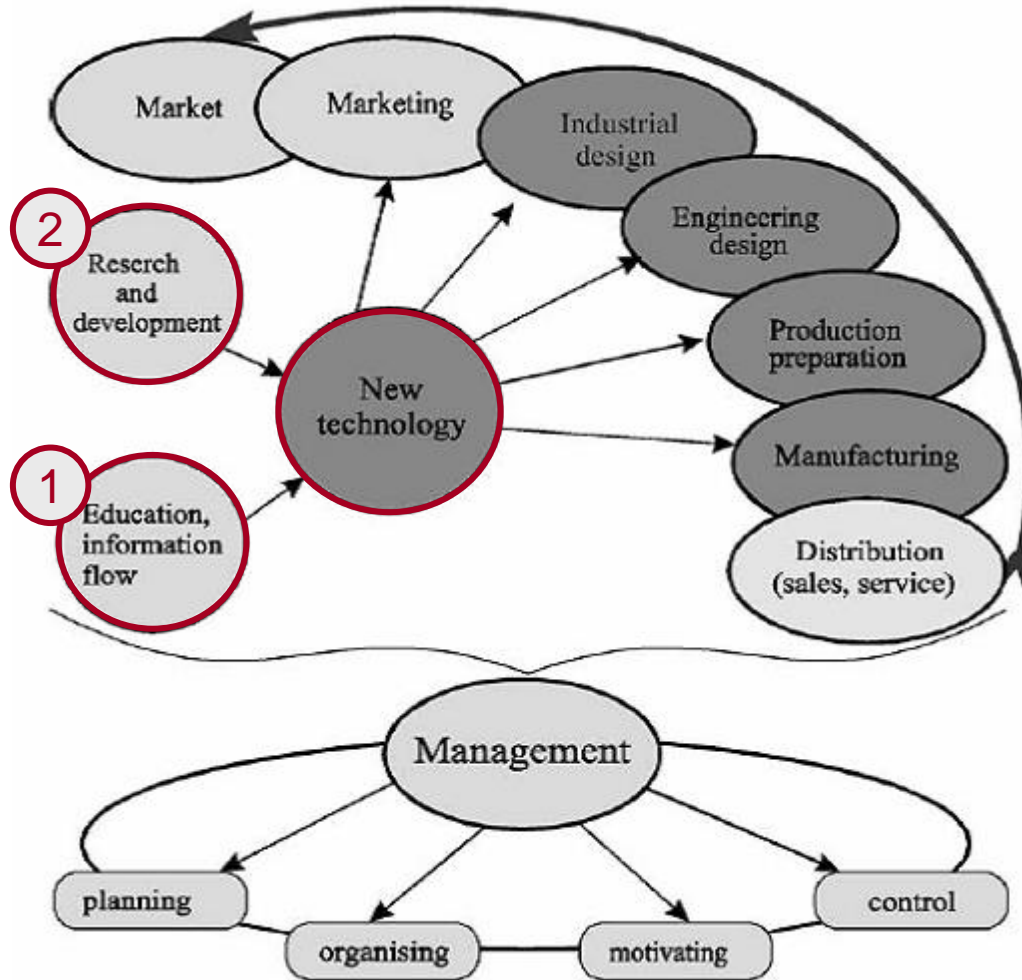
Innovation in Metallurgical Production

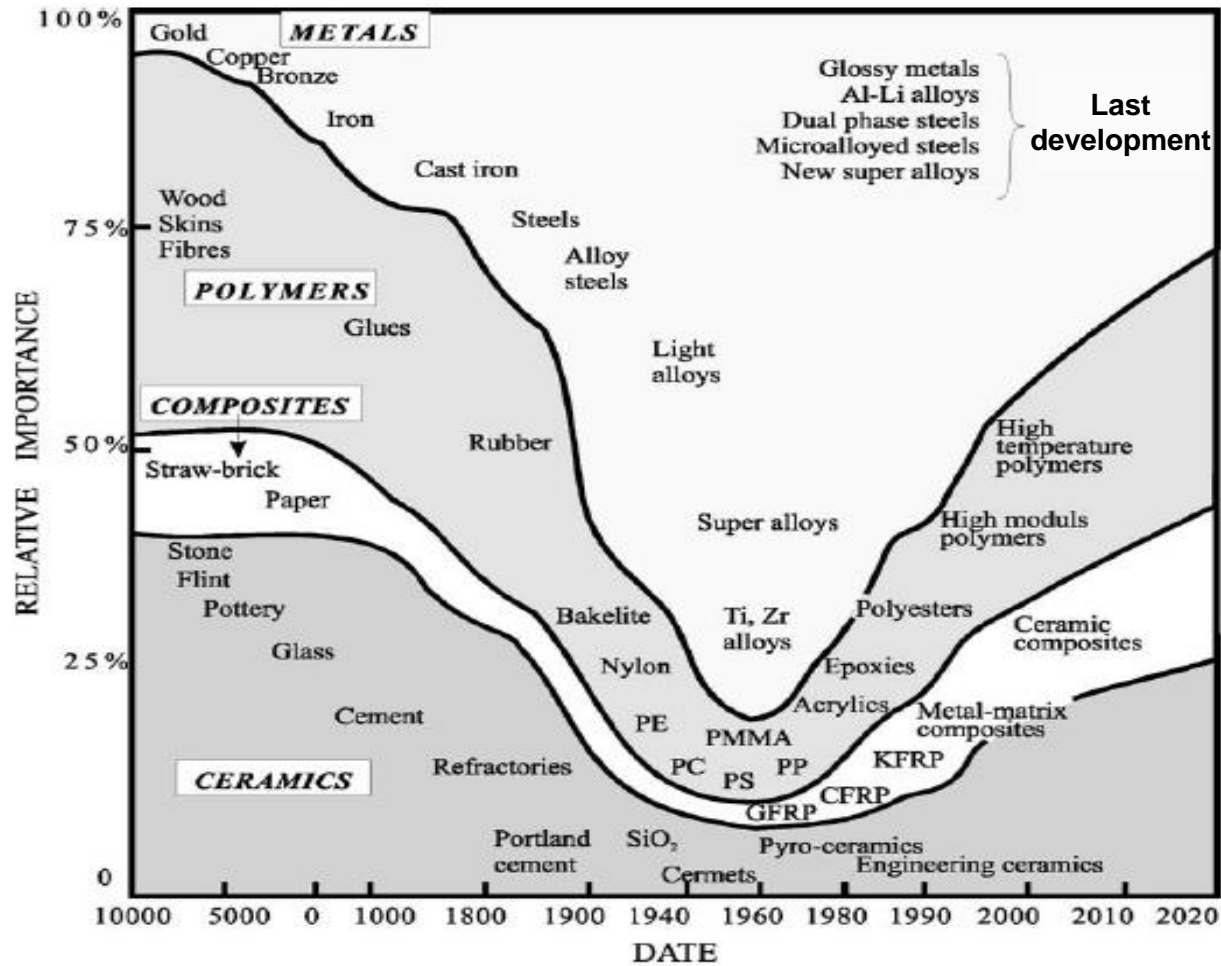


Steelmaking &
Foundry technologies

Metallic Materials







The material development has been always brought by *innovative processes*

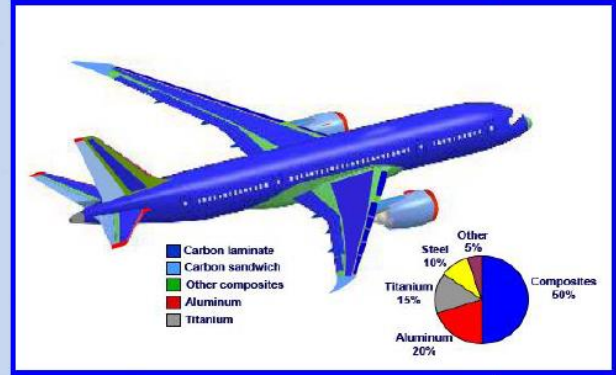
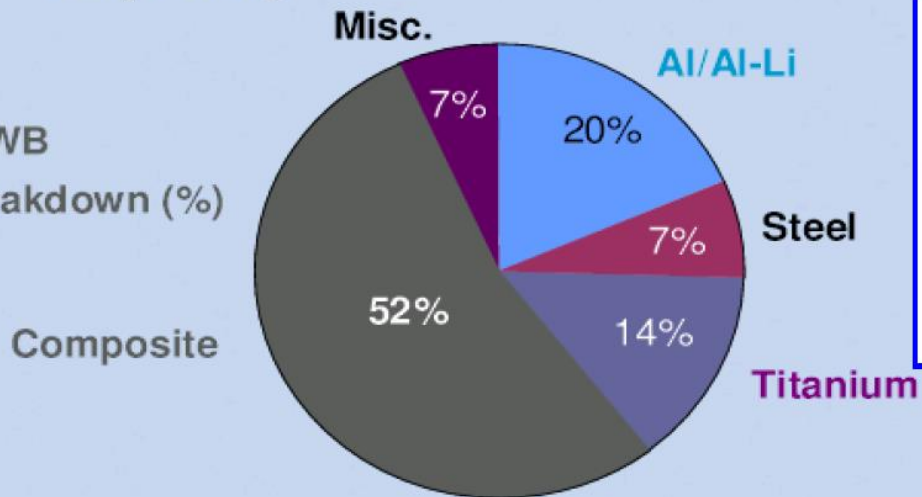




A350 XWB puts the right material in the right place!

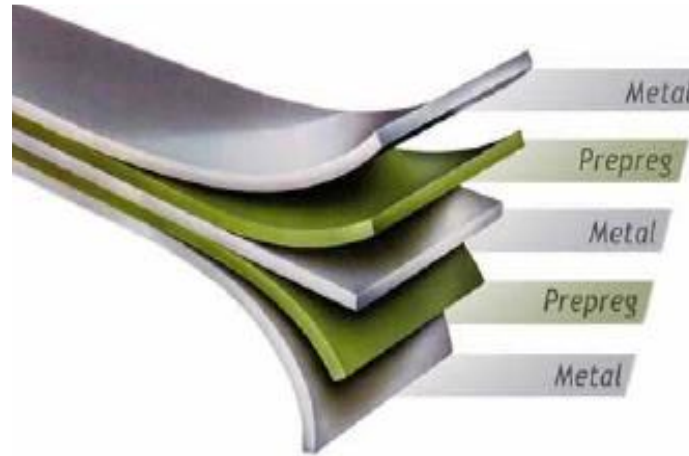


**A350-900 XWB
Material Breakdown (%)**
Including Landing Gear



G. Hellard, Airbus, 4/2007



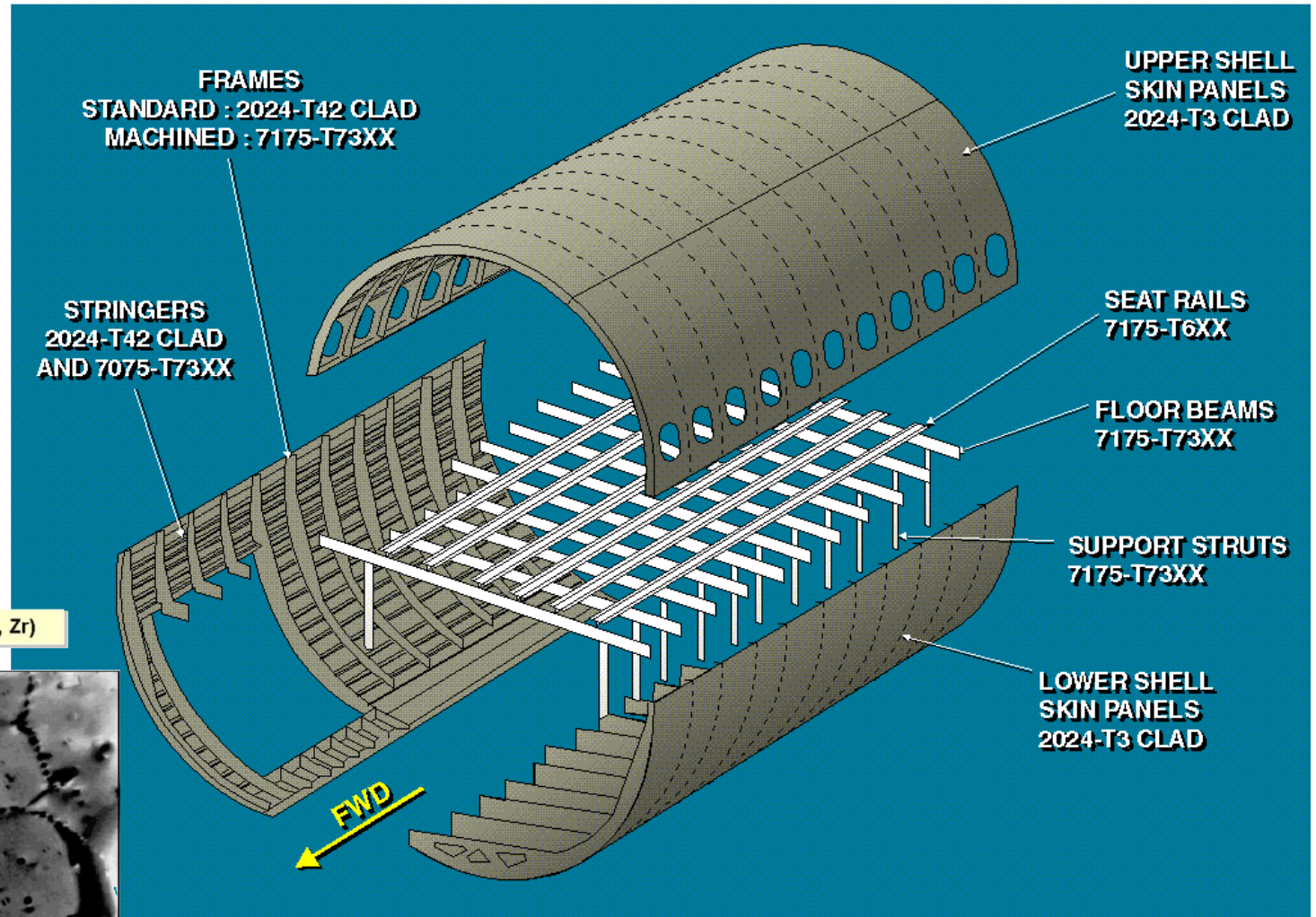


GLARE:
Glass Laminate
Aluminium Reinforced
Epoxy
(composite-Al alloy)

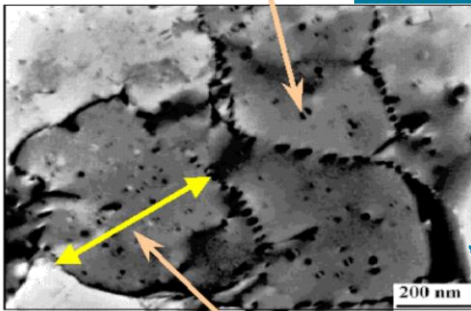
Applications:

- Fuselage panels
- Leading edges
- Floor panels

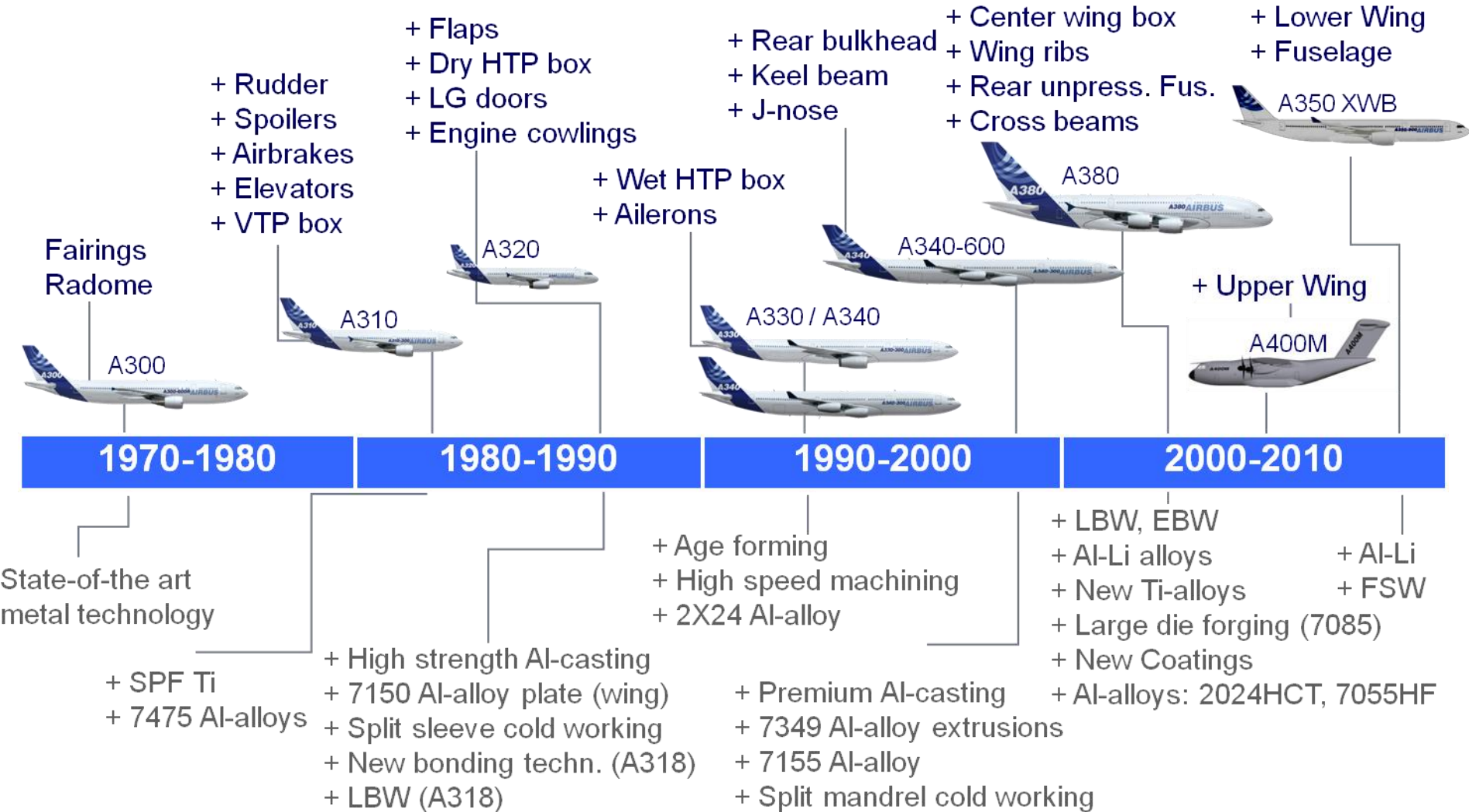




particles $Al_3(Sc, Zr)$



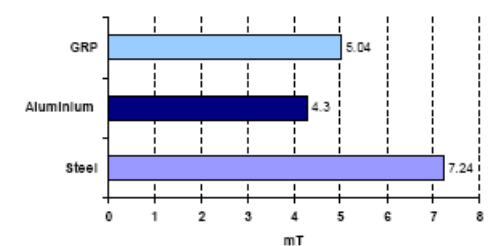
subgrain diameter $0.5 \mu m$





- Length : 46.2m
- Max width : 8.7m
- Speed : 18 knots

Weight central hull module 5.4m long



- With Aluminium 37% weight saving on hull

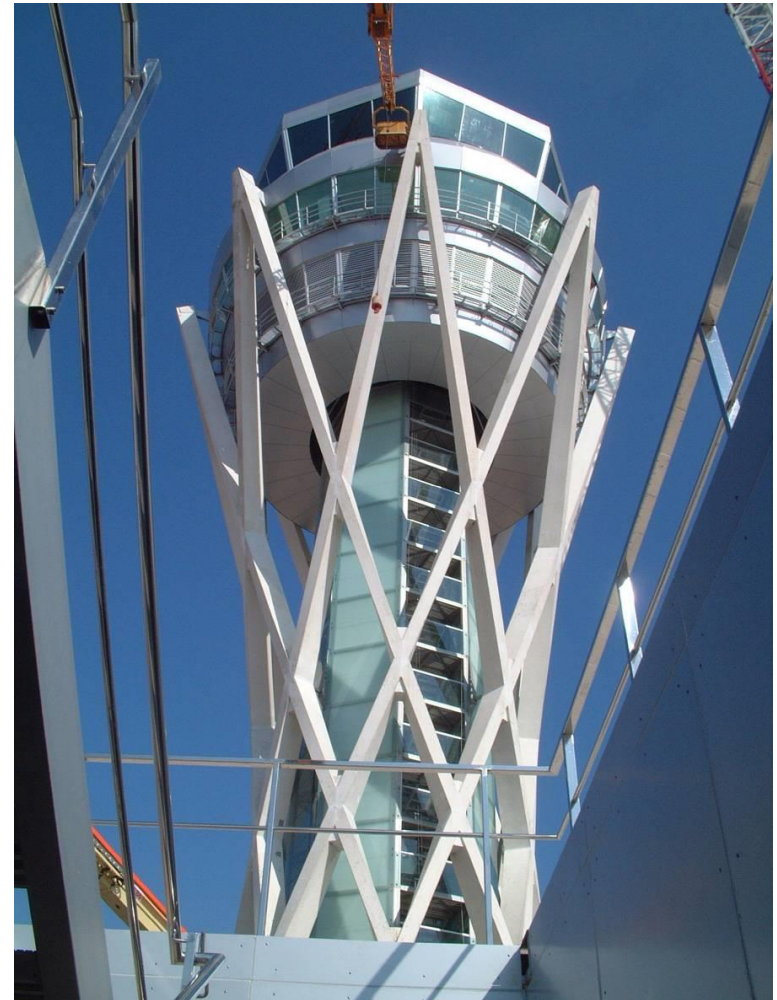
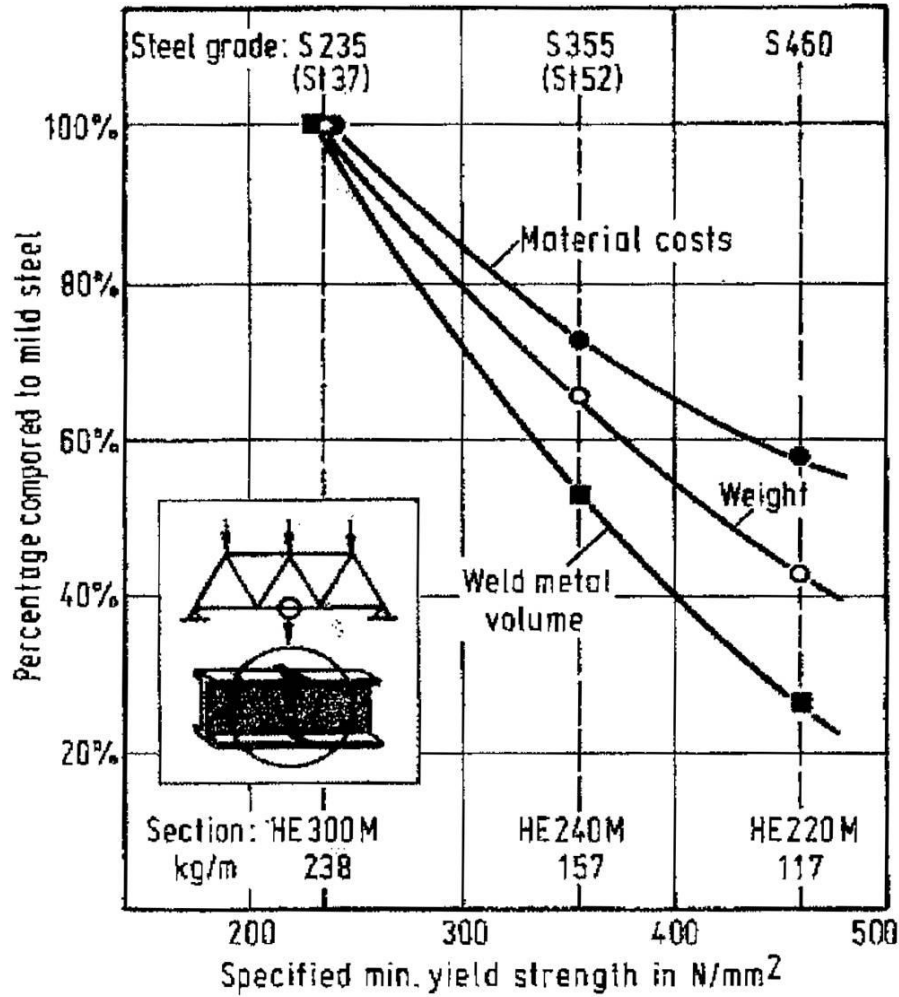


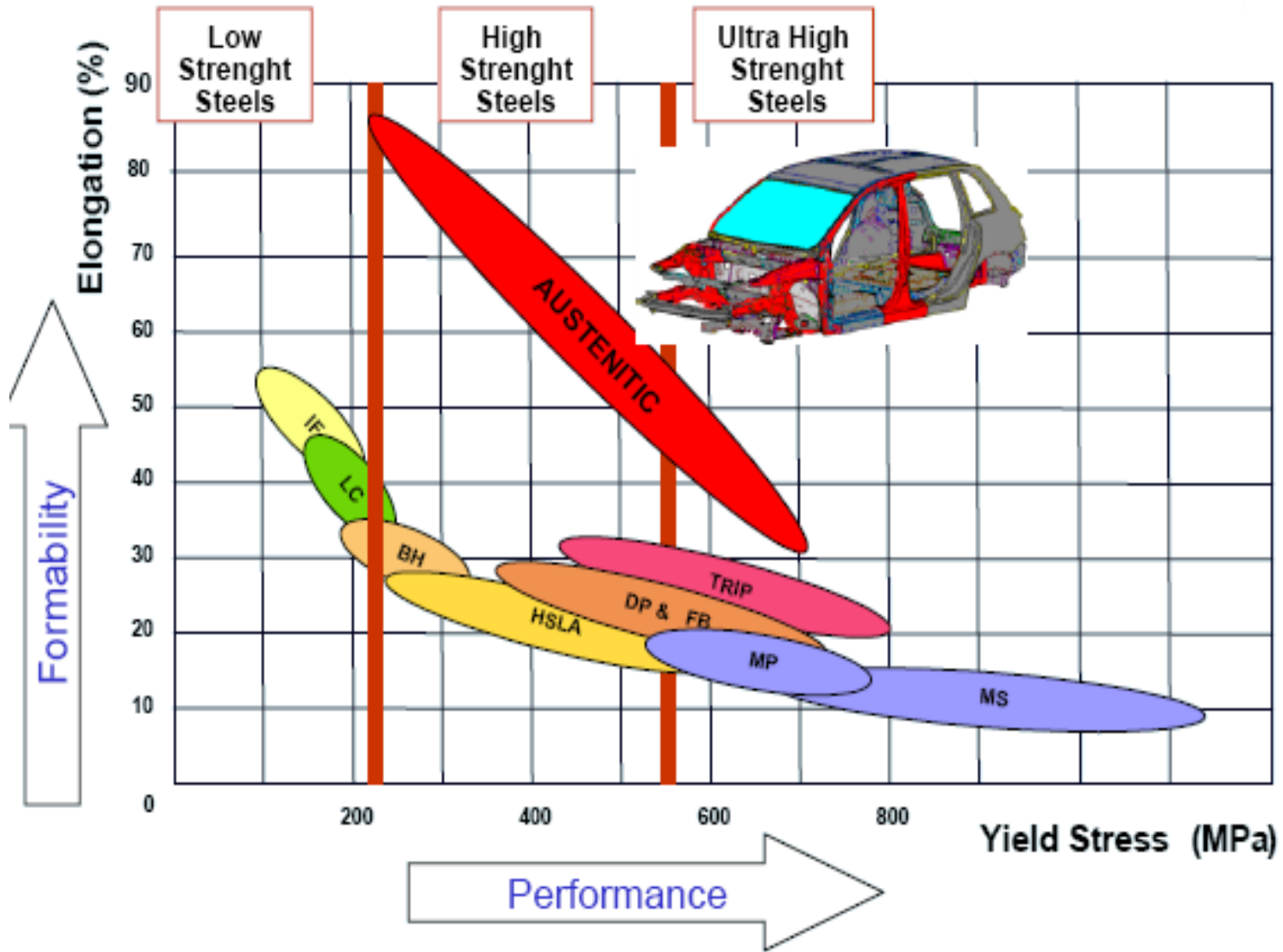


Shipbuilding Material	$\gamma [daN/m^3]$	$\sigma_t [N/mm^2]$	$\sigma_y [N/mm^2]$	$E [N/mm^2]$	$\sigma_t / \gamma [mm^4]$	$E / \gamma [mm^4]$
Construction steel A,B,D,E	7800	450	235	206000	5.80	2641
High strength steel AH32, DH32, EH32, FH32	7800	570	315	206000	7.3	2641
AH36, DH36, EH36, FH36	7800	630	355	206000	8.07	2641
AH40, DH40, EH40, FH40	7800	660	390	206000	8.5	2641
AlMg5083 H321	2700	310	215	70000	11.48	2593
AlMg5083 H321 welded	2700	280	168	70000	10.37	2593
AlMg5083 H111	2700	290	125	70000	10.74	2593
AlSi6061 T5/T6	2700	260	240	70000	9.63	2593
AlSi6082 T5/T6	2700	310	260	70000	1.48	2593
GRP	1550	190		13000	12.25	839
Wood	750	90		12500	12	1666

- GRP mechanical properties are variable according to lamination combinations.
- Wood is still a valid alternative for boats (yachts) up to 20-22m long









**Bachelor's
degree
in Industrial
Engineering**



Chemistry & Metallic
Materials



Basic knowledge:
materials science and
principal metal alloys

**Degree in
Industrial
Engineering**



Metallurgical Industrial
Applications



Main metallurgical
processes



Innovation in Metallurgical
Production



Rule of *innovation* inside
the *metallurgical industry*

**Capability of Managing
Production & Innovation
into Engineering Industry**



Prof. Giulio TIMELLI



Dipart. di Tecnica e Gestione dei Sistemi Industriali
Università di Padova, sede di Vicenza
Str. S. Nicola, 3 – 36100 Vicenza (Italy)

e-mail: timelli@gest.unipd.it

phone: +39 0444 998769

fax: +39 0444 998889

Office: 2° floor - San Nicola Building





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Prossimi **eventi**
in programmazione

AIM
Via Filippo Turati 8, 20121, Milano
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+39.02.76397770
Fax. +39.02.76020551
Email: aim@aimnet.it

17/06/2020
ECCC 2020
The 10th European Continuous Casting Conference – ECC 2020 – will be organised by AIM, the Italian Association for Metallurgy, in Bari (Italy) on 17-19 June 2020 with focus on the statu... [.]

HOME COME ASSOCIARSI MANIFESTAZIONI PUBBLICAZIONI RIVISTA CENTRI DI STUDIO NOVITA' BACHECA CONTATTI

Prossimi eventi	Ultime pubblicazioni	Centri di studio
	<p>16/09/2019 Milano Additive metallurgy Materiali metallici e fabbricazione additiva Corso ADDITIVE METALLURGY MATERIALI METALLICI E FABBRICAZIONE ADDITIVA Organizzato dai Centri di Studio AIM Metallurgia delle Polveri [.]</p>	
	<p>17/09/2019 Vicenza Metallografia - Modulo Leghe Leggere</p>	

La Metallurgia italiana

Per ricevere la rivista La Metallurgia Italiana iscriviti all'AIM. Tutti i soci AIM ricevono gratuitamente la rivista.

ISCRIVITI ALL'AIM

Ricerca nel sito



Eventi gratuiti previa registrazione (15€)

www.metallurgia-italiana.net

