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Open Call – HPDC Pilot Line

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European Commission

Horizon 2020
European Union funding
for Research & Innovation

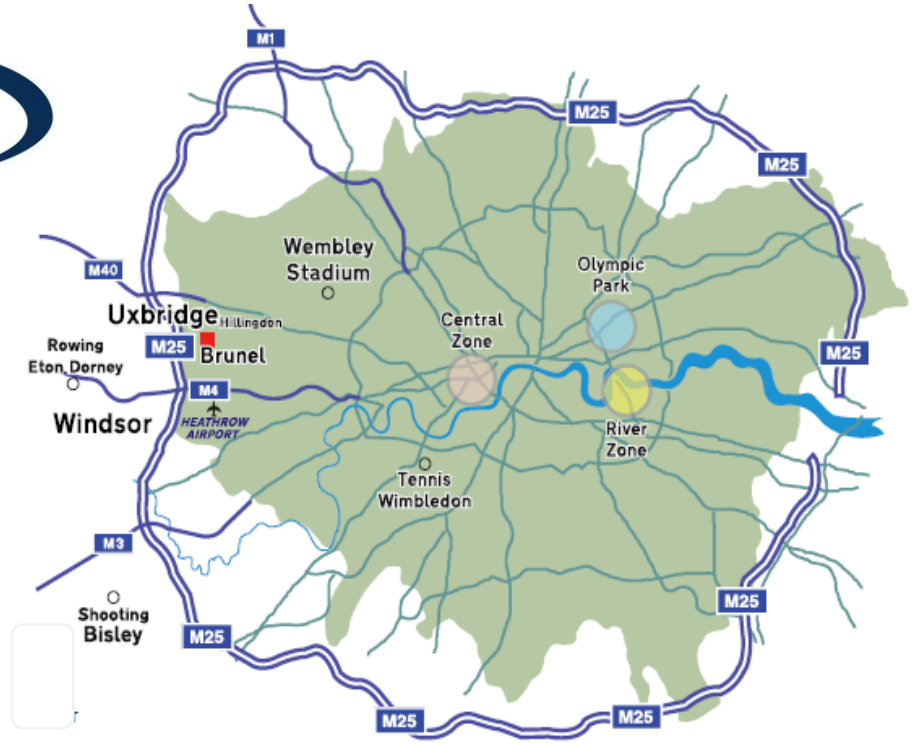
Where is the HPDC pilot line

Brunel University London

BCAST

Isambard Kingdom Brunel

1806-1859



Founded 1966
15,000 students
>100 countries

Schools in:
- **Engineering**
- **Science**
- **Business**
- **Sports**
- **Arts**

Research Themes

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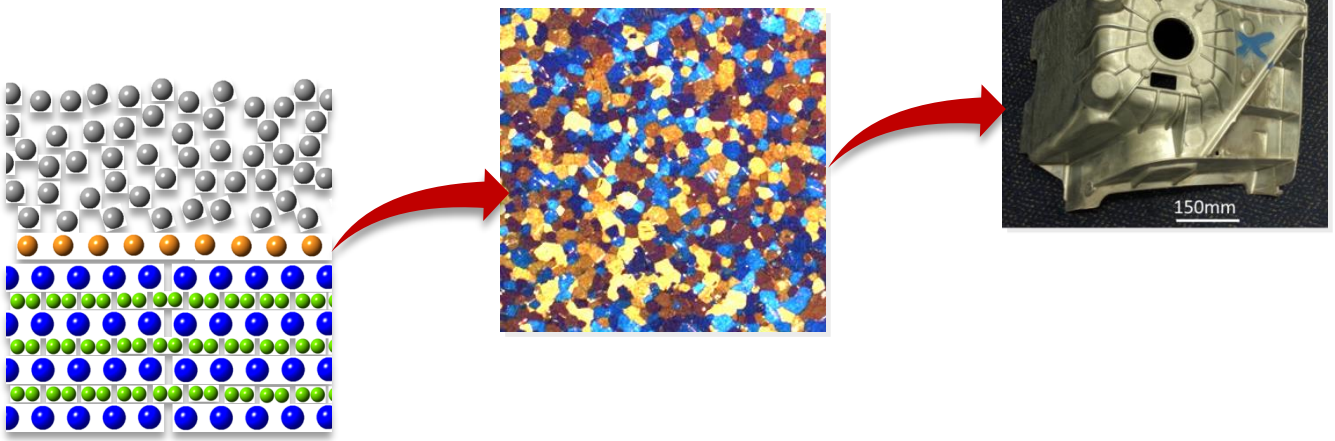
BCAST Overview

BCAST - Brunel Centre for Advanced Solidification Technology

- Established in October 2002
- The research group comprises over 100 members of staff and students.
- Work closely with industrial partners, like Constellium University Technology Centre (UTC) and Jaguar Land Rover (JLR) etc.
- Fundamental research to industrial applications on solidification and lightweight metals.

From atoms to applications



HPDC pilot line workflows

Ingots → Melting → Degassing → NPs introduction → Casting → Trimming →

Quality check
- Composition

Quality check
- Temperature

Quality check
- Composition
- H-content

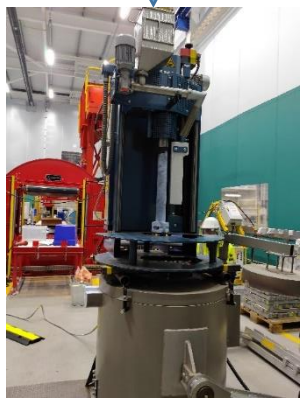
Quality check
- Mixing
- NPs distribution
- Thermal analysis

Quality check
- HPDC parameters
- Monitoring (IR Camera, GOM, CT)

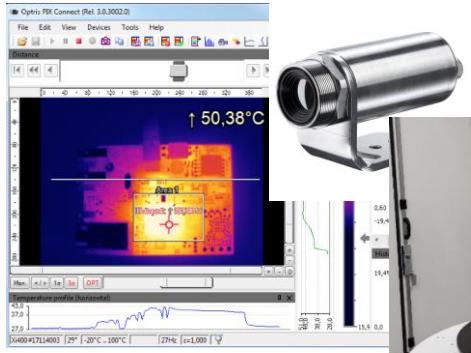
Quality check
- Metallurgical characterisations
- Mechanical properties

Foundry-Master (OES)

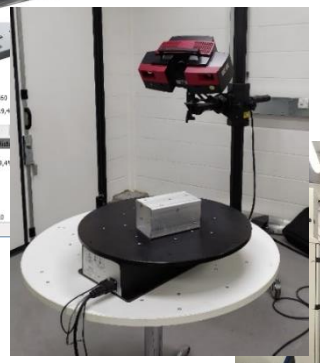
RPT- H content



Degassing and mixing



IR Camera



GOM

X-ray CT

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Research Facilities

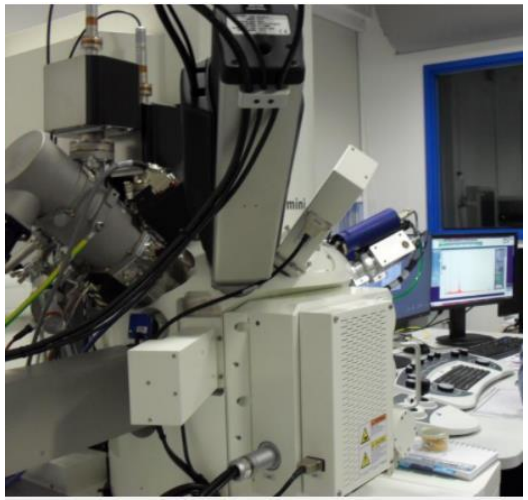
- Wide range of casting lines (DC, GDC, HPDC, LPDC, SC, TRC…)
- Mechanical testing (Hardness indenter, tensile, bending, fatigue …)
- Characterisations (GOM, x-ray CT, SEM/EDS, TEM, XRD…)

HPDC machine

HV indenter

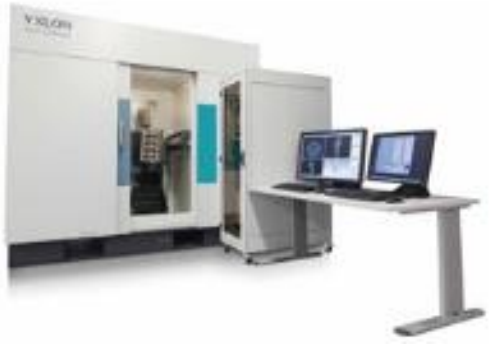
Tensile and fatigue

Zeiss Crossbeam (SEM)

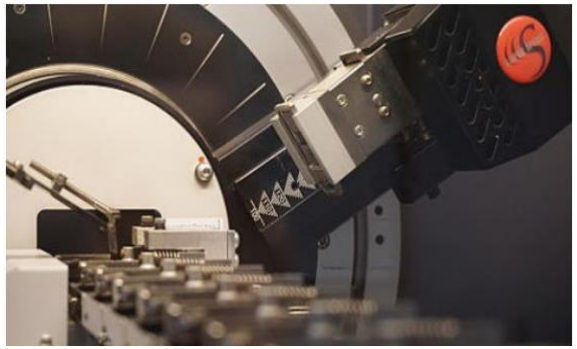


JEOL 2100 (TEM)

Micro/Macro CT Scan



X-Ray Diffraction



HPDC pilot line

FRECH DAK 450-54

- Al Castings from 1.5 kg to 5 kg
- Mg Castings from 1 kg to 3 kg
- 2x 40 kg furnaces
- Ladled by hand
- Cycle times ~120 sec
- Pfeiffer Vacuum system, 50 to 70 mbar
- Max size of platen 1060×1060 mm

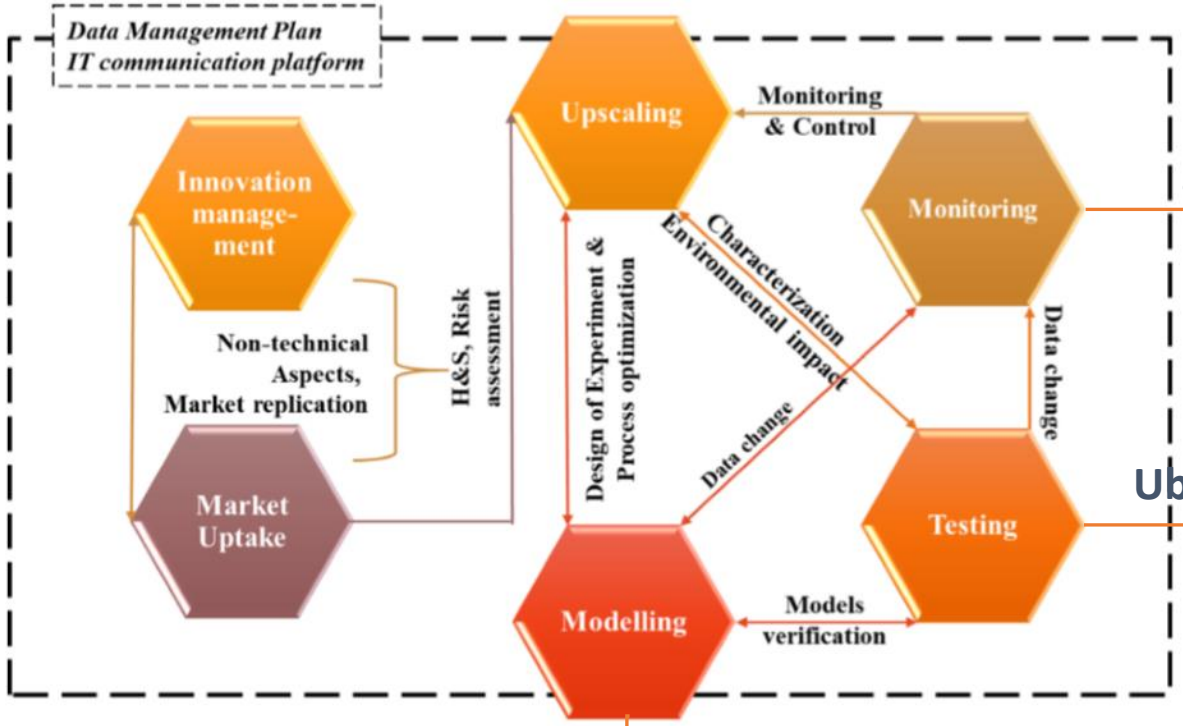
HPDC pilot line

FRECH DAK 1680-133

- Al Castings from 8 kg to 32 kg
- 600 kg dosing furnace
- ABB robotics (IRC5 M2004)
- Typical cycle times 60-120 sec
- Vacuum assisted HPDC (50 -80 mbar)
- Vacural (high vacuum HPDC) 20-30mbar
- Max size of platen 1950×1950 mm

K-Series		*	K 1680-
		1 2 3	133 112 88
Zuhaltekraft Locking force	kN		16.800
Aufspannplatten Size of platen	mm		1.950 x 1.950
Säulenabstand Space beween tie bars	mm		1.300
Gießposition Shot position	mm		0 – 420
Gießkraft max. Max. casting force	kN	1 2 3	1.330 1.120 881
Gießkolbendurchmesser Injec. plunger diameter	mm	1 2 3	80 – 160 80 – 140 70 – 140
Gießhub Casting stroke	mm	1 2 3	900 900 800
Gießvolumen Casting volume	cm^3	1 2 3	3.016 – 12.064 3.016 – 9.236 2.053 – 8.210
Spez. Gießdruck Spec. injec. pressure	bar	1 2 3	2.646 – 661 2.228 – 728 2.289 – 572
Zugeh. Trennfl. von – bis Casting area from – to	cm^2	1 2 3	635 – 2.540 754 – 2.309 734 – 2.935

HPDC PL in connection with other BBs



Stam, ISQ, VISUM

- Processing monitoring
- Process control

Ubrun, Hidria, Vertech

- Structural characterization
- Functional properties testing
- Field tests
- Environmental impact
- LCA

ACCESS

- Process optimization
- Simulations
- Predictive modelling

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Thank you for your attention

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