



Foundry 4.0

By Mickael DERNONCOURT, Manufacturing Casting Engineer



1

19/10/2019

HamiltonJet

- Based in Christchurch New Zealand
- Invention of Sir William Hamilton 70 years ago
- Employ approx. 380 employees in the world, approx 300 in Christchurch.
- 60 000 waterjet units installed around the world
- More than 95% export
- Power inputs from 150kW to 5500kW for vessels up to 80 meters
- Patrol boats, Fast ferries, Offshore crew boats, Fire boats, Fishing vessels, Recreational and Military craft.



2

2

19/10/2019

HamiltonJet



Small Jet range from 212mm impeller diameter to 322mm.



Large Jet range from 364mm impeller diameter to 1000mm!!!



3

3

19/10/2019

HamiltonJet

Production facilities:

Casting, Machining, Painting, Assembling line, all electronics and hydraulics made in-house

2 Aluminium Foundries, sand casting with mould range from 300mm x 300mm up to 3 meters by 3 meters
Weight between few grams to 2 tons

Investment casting foundry for Stainless Steel

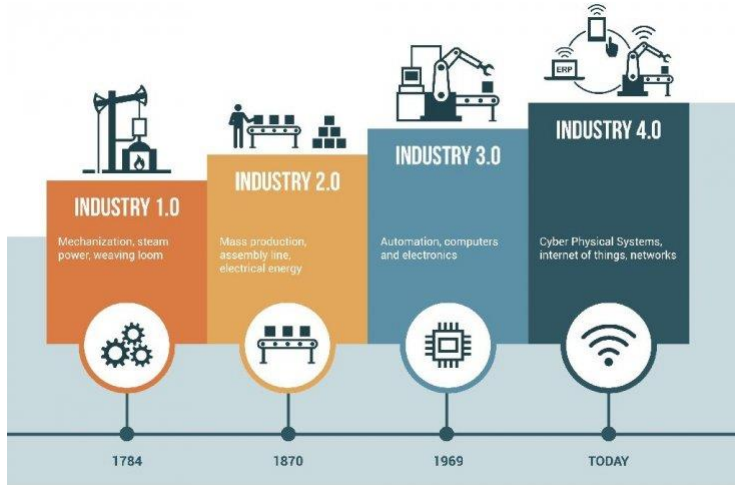


4

4

19/10/2019

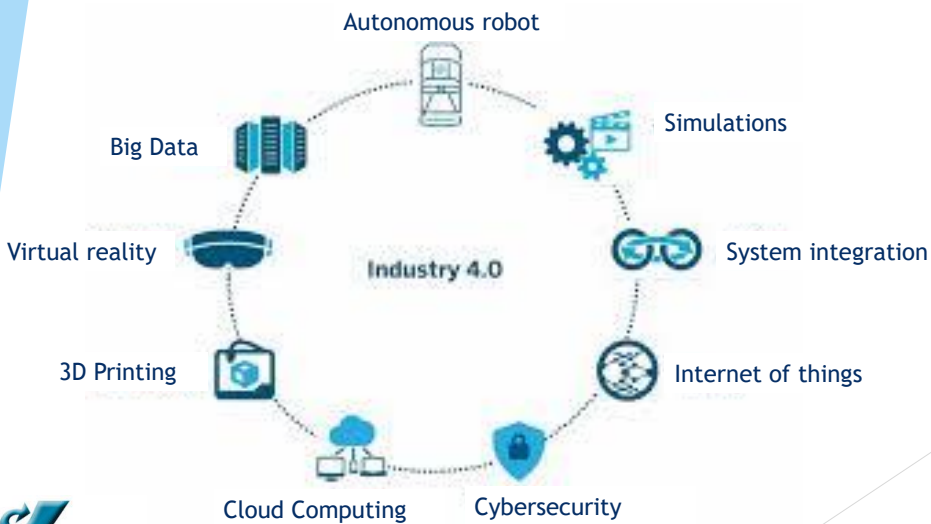
Introduction



5

19/10/2019

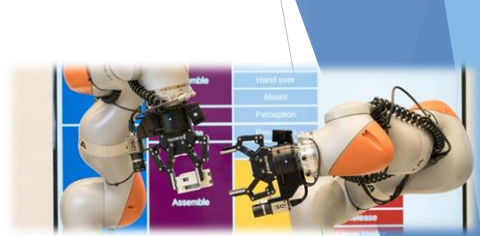
Industry 4.0



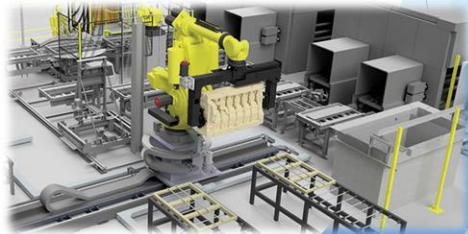
6

19/10/2019

Autonomous robot



Robot's arm autonomously divide tasks and work together with Humans.

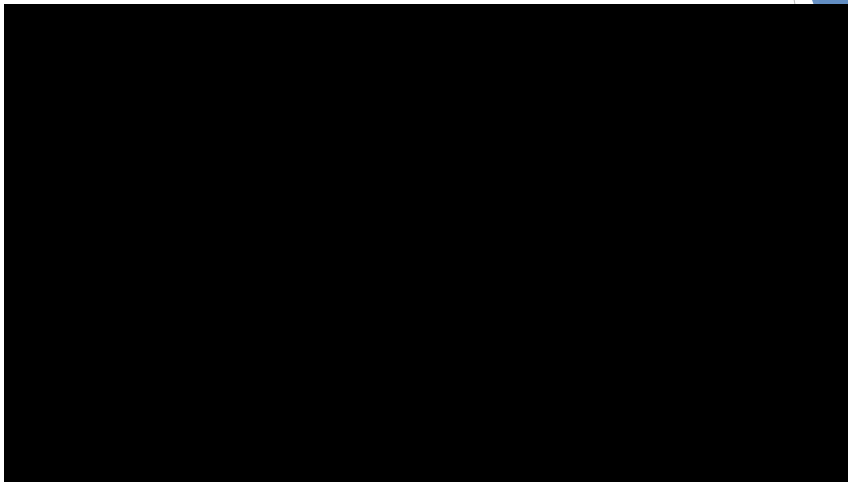


7

7

19/10/2019

Autonomous robot

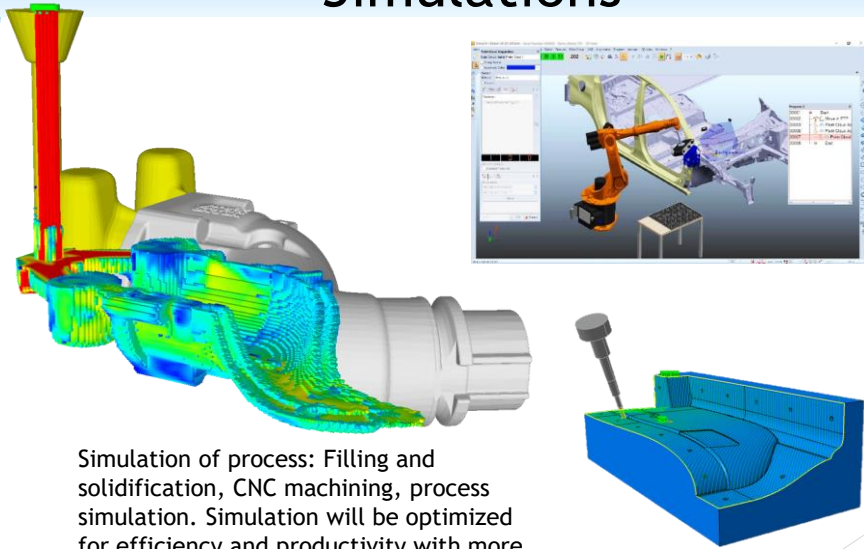


8

8

19/10/2019

Simulations

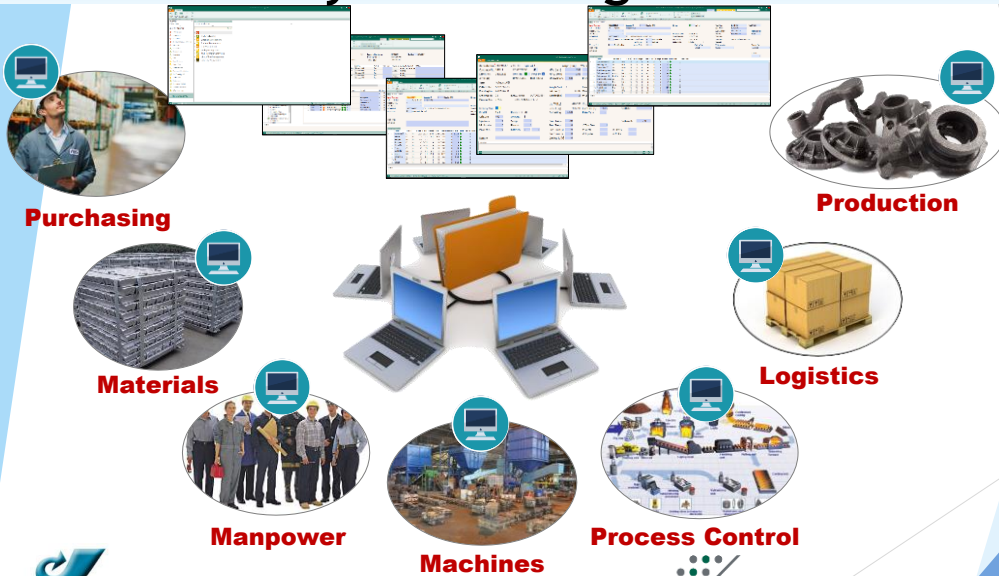


Simulation of process: Filling and solidification, CNC machining, process simulation. Simulation will be optimized for efficiency and productivity with more powerful computers



19/10/2019

System integration



Purchasing

Production

Materials

Logistics

Manpower

Machines

Process Control



Reference:

19/10/2019

Internet of things



Smart building



Sensor + communication technology



Supplier



Smart Foundry



Connectivity

19/10/2019

Cybersecurity



19/10/2019

Cloud computing



APAS: Autonomous Production Assistant, M2H: Machine to Human, OEE: Overall Equipment Effectiveness

- Digital Supply Chain**
 - ▶ Stock saving
 - ▶ Efficiency increase
 - ▶ Transparency along supply chain
- Convertible Equipment**
 - ▶ Fix cost reduction
 - ▶ Efficient M2H collaboration
 - ▶ Human relief of heavy load /repetitive tasks
- Shop Floor Mgmt. Information**
 - ▶ Real time data
 - ▶ Fast escalation
 - ▶ Paperless
- Power / Energy Management**
 - ▶ Peak reduction
 - ▶ Energy cost saving
- Operator Support**
 - ▶ Agility & quick reaction
 - ▶ Quality increase
 - ▶ Efficiency increase
- Predictive Maintenance**
 - ▶ Improve OEE
 - ▶ No sudden breakdown
 - ▶ Reduce changeovers
- Adaptive Testing**
 - ▶ Increase efficiency
 - ▶ Less invest
- Quality Improvement**
 - ▶ Instant feedback
 - ▶ Fast identification of error sources

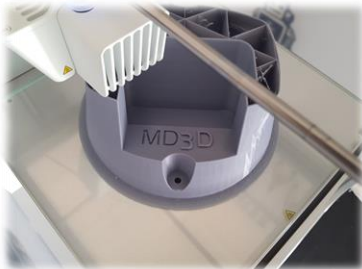
Using the data collected by sensors and building a computer model of your product or process will allow you to create a Digital Twin. This will give you real-time status updates on your product and processes, as well as going through ‘what-if?’ scenarios, without putting your assets at risk



Reference: **CallaghanInnovation**

19/10/2019

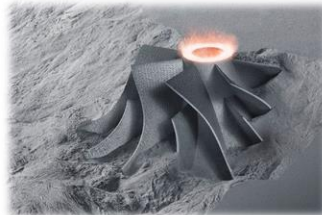
3D Printing



3D Printing FDM (Fused Deposition Modeling)



3D Sand Printing



Laser Sintering

Speed, Quality, Materials, you will be able to print on demand



19/10/2019

Virtual reality



Simulated environment to introduce product to customer, maintenance etc...



15

15

19/10/2019

Big Data



Data sets grow [things](#) devices [identification](#) (R has roughly dou Based on an IDC between 2013 a determining who should own big-data initiatives that affect the entire organization.

Internet of Information ated. es is

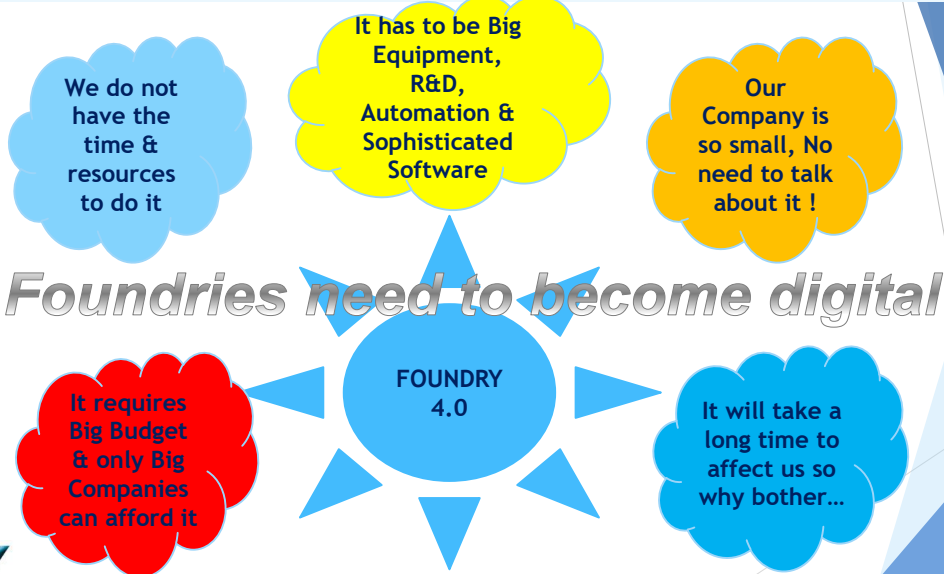


16

16

19/10/2019

Foundry 4.0

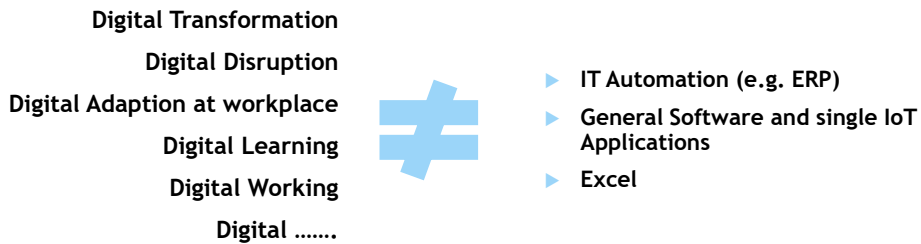


17

17

19/10/2019

Foundry 4.0



Digital Transformation = People + Process + Technology on ONE COMMON DIGITAL PLATFORM
IT'S A JOURNEY TO ACHIEVE THAT



18

18

19/10/2019

Foundry App



19

19

19/10/2019

Foundry App



20

20

19/10/2019

RFID in the Foundry

RFID = Radio Frequency IDentification



21

21

19/10/2019

Collection of Data

OPTI GIS - Foundry Information-System

MATERIAL USAGE MELT

DATUMV	DATU...	MATID...	CHA...	MAT...	MAT RA...	FURNACE #	Mat. Qt...	MatCo...	Mat. Costs ...
1/5/2012	1/5/2012	6017-0000	1000000	1.4581	Kahle	1	0.00	€8.15	€0.00
1/5/2012	1/5/2012	6015-0000	1000000	1.4581	Ferro-Niob	1	33.00	€23.50	€775.50
1/5/2012	1/5/2012	6015-0000	1000000	1.4581	Ferro-Men	1	14.00	€2.50	€35.00
1/5/2012	1/5/2012	6015-0000	1000000	1.4581	Ferro-Chro	1	600.00	€3.06	€1,836.00
1/5/2012	1/5/2012	6014-0000	1000000	1.4581	Si-Met	1	52.00	€1.00	€52.00
1/5/2012	1/5/2012	6013-0000	1000000	1.4581	6523 Schrott	1	1143.00	€9.37	€422.91
1/5/2012	1/5/2012	6013-0000	1000000	1.4581	4435 Bleche	1	357.00	€2.17	€774.69

2012 2013 2014

1.4581	€271,653.46	€29,741.80	€33,206.43
239	€21,584.14		
Grand Total	€271,653.46	€51,325.94	€33,206.43

Running Total of Mat.Costs

Chart 1: Running Total of Mat.Costs (Bar chart showing cumulative costs over time)

Charge Material over Time (Line chart showing material charges over time)



Reference: RGU FRP

22

22

19/10/2019

Collection of Data

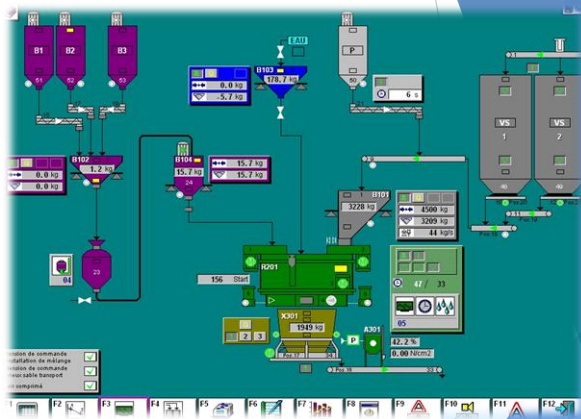


23

23

19/10/2019

Example 1



Reference:



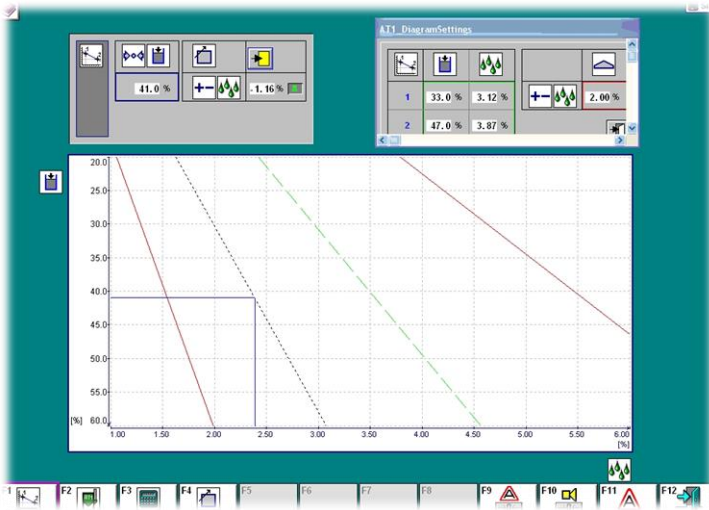
Engineering project Mickael Derroncourt

24

24

19/10/2019

Example 1



Capture the data in real time

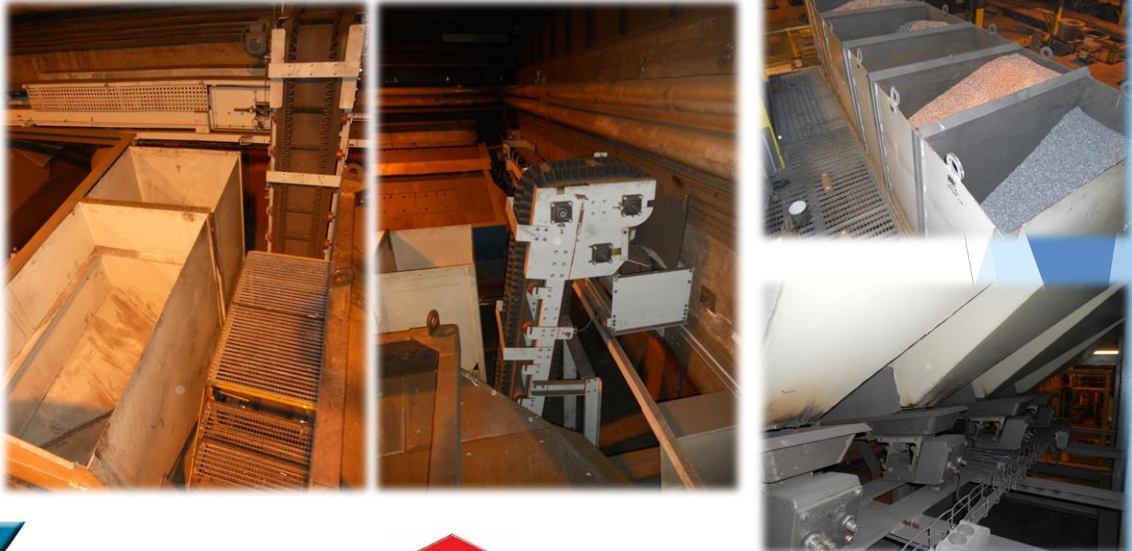


25

25

19/10/2019

Example 2



Reference:



Engineering project Mickael Derroncourt

26

26

19/10/2019

Example 2

The screenshot shows a software interface for 'SUIVI DES CHARGES A LA FUSION'. It features a table with columns for 'Trémie', 'Fonte', 'Etat Charge', 'Poids Total', 'Poids Réel', 'Demande Remplissage', 'Demande auto.', and 'VALEURS DES ADDITIFS A AJOUTER' (C, Si, Mn, Cu, P). The table contains four rows of data, with the first row highlighted in green and the second in yellow. Below the table, there are sections for 'Demande d'une fonte avec de nouvelles valeurs' and 'Charges envoyées en attente'.

Trémie	Fonte	Etat Charge	Poids Total	Poids Réel	Demande Remplissage	Demande auto.	C (kg)	Si (kg)	Mn (kg)	Cu (kg)	P (kg)
I	FGS	Charge en cours	4 000	3 984	Demarrer	Arrêter	0	0	0	0	0
II	FGS	Charge terminée - attente fusion	4 000	4 018	Demarrer	Arrêter	31	9	0	0	0
III			0	0	Demarrer	Arrêter	124	109	21	8	0
IV			0	0	Nettoyer	Vider	0	0	0	0	0
Caïsse CC			0	0	Nettoyer	Vider	35	37	6	6	0

27

27

19/10/2019

Conclusion

Becoming a Foundry 4.0 is **VITAL** because it will:

- Give access to real time data or any data.
- Monitoring and Analysis of processes not seen in real time
- Improve planning and reduce bottlenecks
- Customer enquiries easy to manage (how long and how much) more data will make it easier to quote.
- Your foundry will be more competitive and flexible, reduced costs and lead times
- Process control = customer trust, more contracts, ISO 9001
- Work on Standard Operation Procedures and simplify standardized processes. This is a prerequisite to digitalizing a company.
- Don't jump into buying expensive solutions first.

Become digital

28

28

19/10/2019

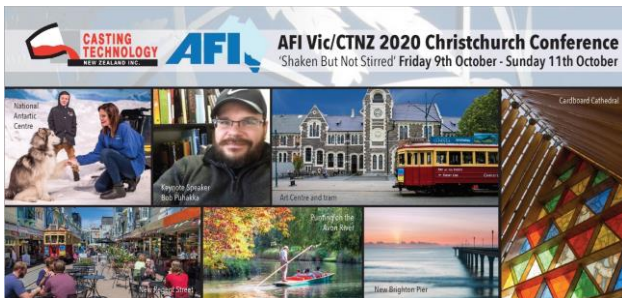
Thank you



29

29

19/10/2019



30

30