

Accelerating the future





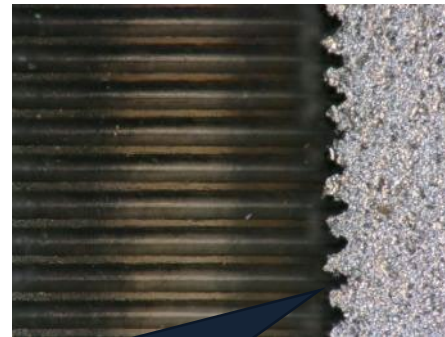
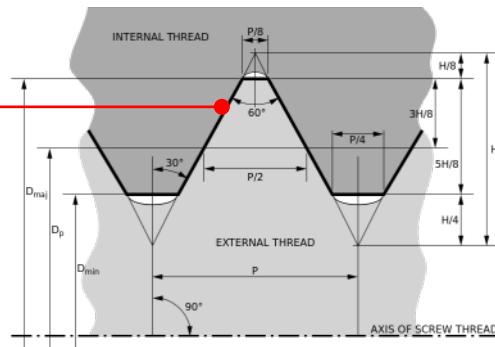
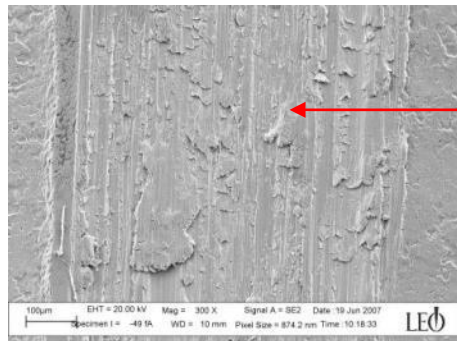
CLEAN MANUFACTURING

Why & How

EXAMPLE

History

- M4x0,15 Screw is used over 4 times before assembly in the cleanroom (matched pair).
- Problems with assembly in the Cleanroom.
- Particles not detected after cleaning.



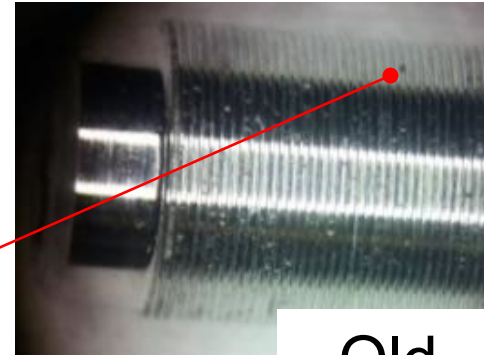
EDM burr

EXAMPLE

Design for Manufacturing, Assembly and ...Tooling & Cleaning



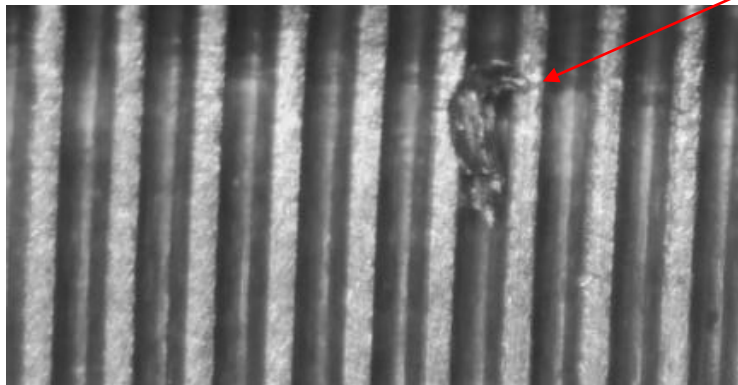
Waste



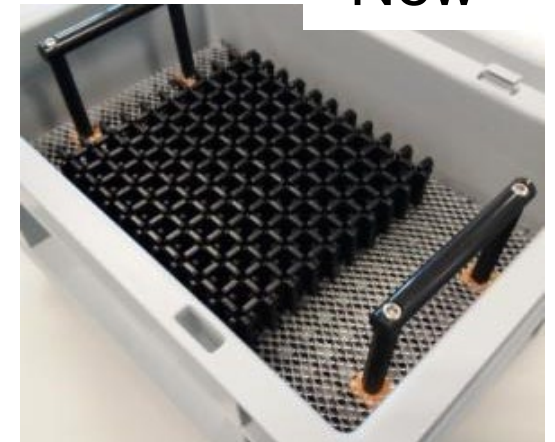
Old



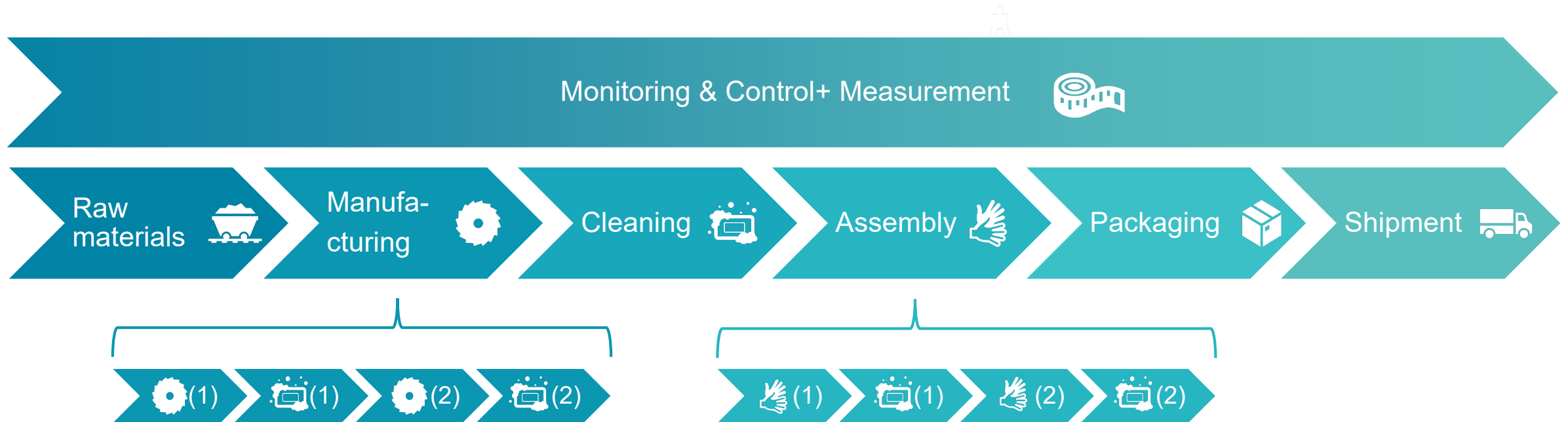
New



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MANUFACTURING STEPS



MANUFACTURING STEPS

Different kind:

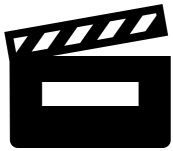
- Rolling
- Casting
- Welding
- Extrusion
- Sheetmetal Working
- Injection Moulding
- Machining; Milling, EDM, deburring (focus)
- Cleaning & Surface Treatment and stains
- ...



CROSS CONTAMINATION

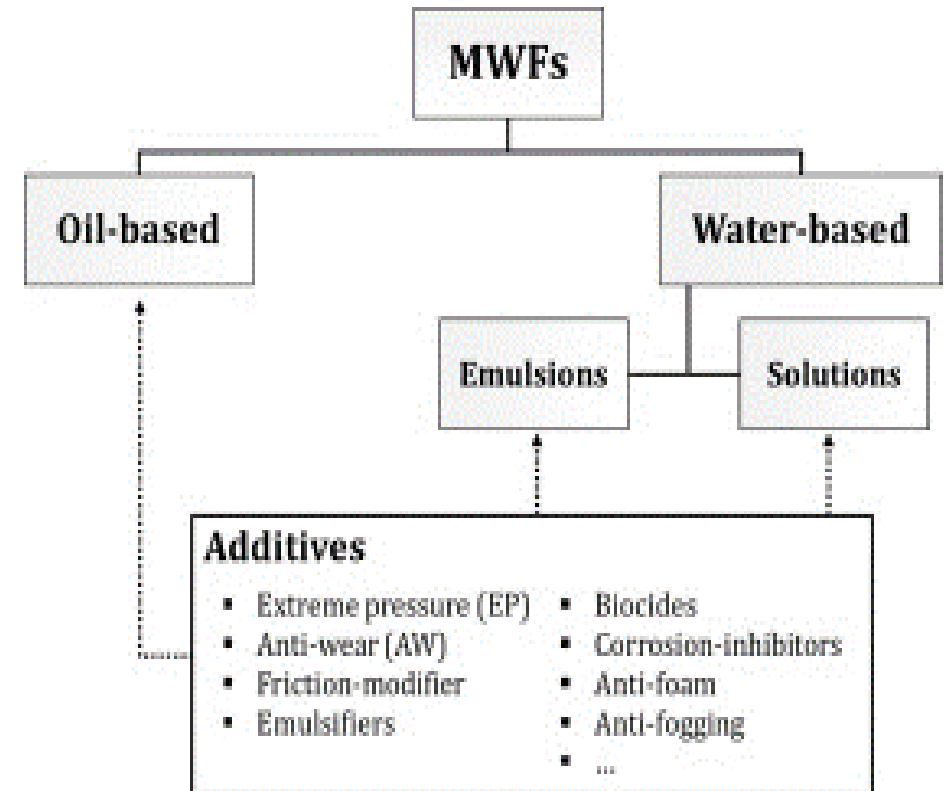


Contamination can come from anywhere...



EMULSION AND MACHINE MANAGEMENT

- Different emulsion types; mineral, synthetic and hybrid.
- Mixing different metals or alloys?
- Leakage (preventive maintenance)
- Emulsion will change and degrade over time.
- Skimming
- Filtration and limitations
- Emulsion will change and degrade over time;
 - EP additives are used.
 - Emulsifiers evaporate
 - ...



EMULSION AND MACHINE MANAGEMENT

Common mistakes:

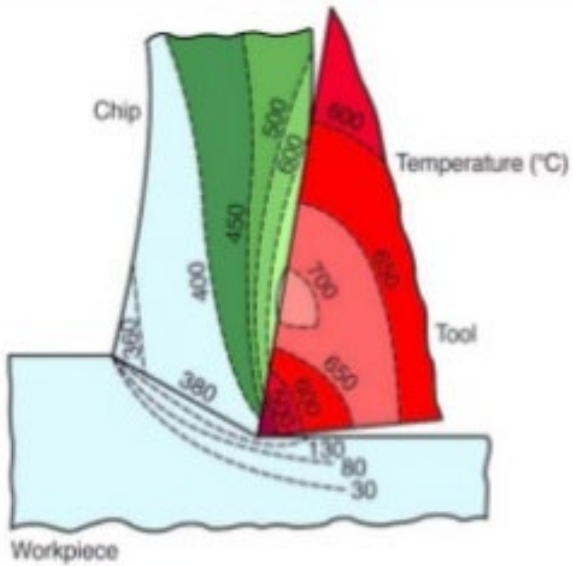
- Lack of routine maintenance
- Dead or non-agitated areas of tanks.
- Not using fresh water for system make-up and top up.
- Emulsion left to stand without agitation for a period of time.
- The build-up of detritus and free oil which can act as nutrients for bacteria



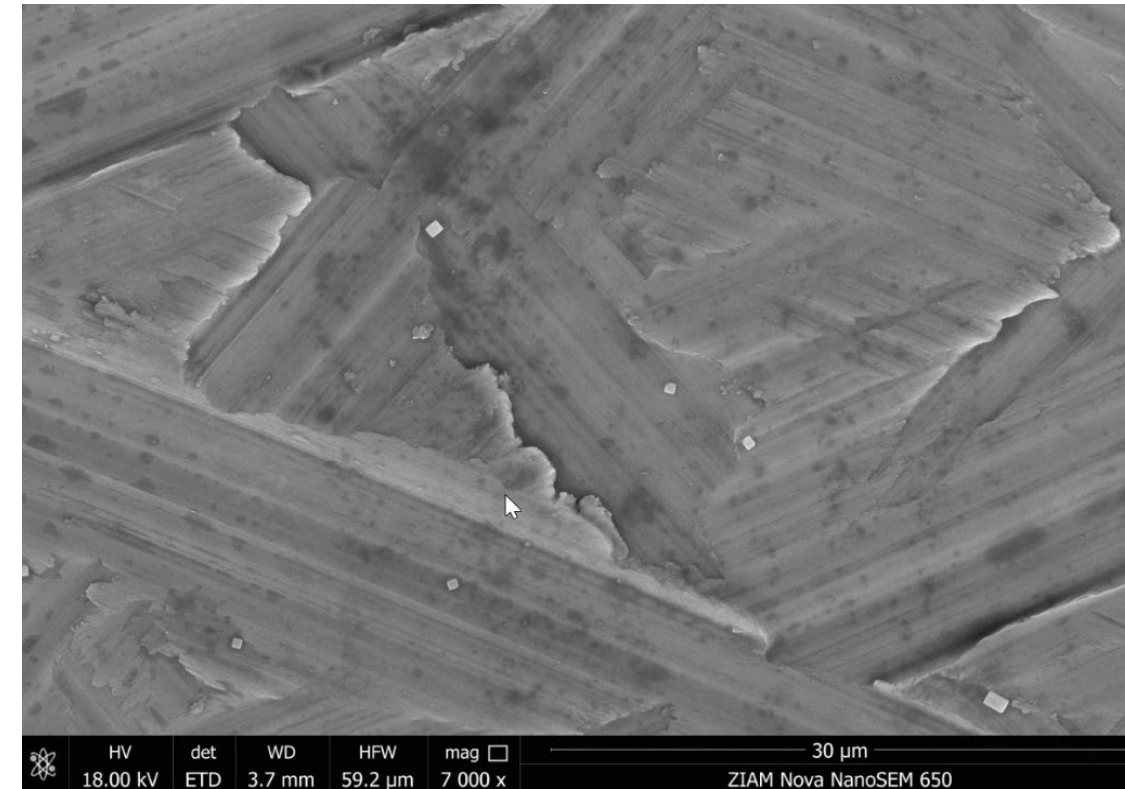
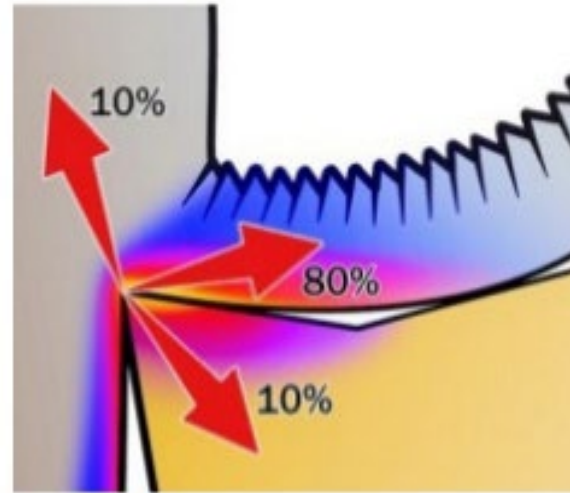
MILLING



Temperatures depend on heat transfer of workpiece material.



By Endka Gandarias



EMULSION AND MACHINE MANAGEMENT



- Tap water or RO?
- Cons of tap water increase of elements.
- Chlorine is really a corrosion starter.

NVWA Rapport

Bedrijf Dunea
Locatie: Scheveningen
Naam: Drinkwater
Gegevens 3e kwartaal 2022



J.W. Lucasweg 2
2031 BE Haarlem
Postbus 734
2003 RS Haarlem
t 023-517 59 00
e info@hetwaterlaboratorium.nl

Parameter	Eenheid	minimum	gemiddelde	maximum	norm DWB minimum	norm DW maximum
Aluminium	µg/l	2,8	2,8	2,8		200
Arseen	µg/l	2,03	2,07	2,10		10
Boor	mg/l	0,050	0,050	0,050		0.5
Calcium	mg/l	36,96	37,40	37,98		
Chloride	mg/l	47	49	52		150**
Koolstofdioxide	mg/l	0,9	1,3	1,8		
Carbonaat	mg/l	< 5	< 5	< 5		
Koper	µg/l	0,7	0,7	0,7		
Geleidingsvermogen	mS/m	46,9	48,0	48,8		<125
Fluoride	mg/l	0,18	0,20	0,23		1.0
IJzer	mg/l	< 0.005	< 0.005	< 0.005		0.2

GEOMETRICAL COMPLEXITY

- Intermediate cleaning
- Surface treatment
- Packaging
- Tooling and handling
- Design for Cleanliness (vented holes)



DEBURRING

- Different burrs and deburring techniques.
- Deburring tools can contaminate; sanding paper = Paper + glue + grit
- Burrs break during assembly and generate particles.





WRAP-UP

- Make it clean
- Keep it clean
- Monitor and control (pH, conductivity, bacterial growth, etc)
- Awareness and training

Thank you

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TOOLING CONTACT



PROCESS RESIDUE TRAPPED

