METALWORKING FLUIDS (MWFs)

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Agenda

1. What is Metalworking?
2. What is metalworking fluids?
3. How to Select the right metalworking fluids
4. Case study
5. Q&A

1.0 What is metalworking?

Forming or cutting a metal to a desire sharp.

1.1 Type of forming and cutting process?

- Casting. -Broaching. -Milling. -Drawing
- Grinding. -Shaving. -Sawing. -Forging
- Polishing. -Drilling. -Stamping. -Rolling
- Turning. -Tapping. -Blanking. -Threading

2.0 What is metalworking fluids (MWFs)?

MWFs are oils or water-based liquids used to cool and lubricate metal during machining, shaping and other process.

2.1.0 What is the functions of MWFs?

- 2.1.1 Primary function:
- Lubrication effect to reduce friction.
- Cooling effect, dispersion heat in between tool and workpiece.
- 2.1.2 Secondary function:
- Cleaning effect to remove metal sludge & chips.
- Anti corrosion effect to prevent workpiece oxidation & rust on metal machine parts / workpiece

2.2.0 Type of MWFs?

- 2.2.1. Oil Base or Straight cutting oils
- Mineral base oil type
- Vegetable base type
- Synthetic base type
- 2.2.2 Water-Based cutting fluids or commonly known as coolant
- Emulsion coolant : >60% mineral base oil content
- Semi synthetic coolant : 20 to 40% mineral base oil content
- Chemical base coolant : main content mixture of amine & surfactant
- Synthetic coolant : main content synthetic base.

3.0 How to select the right MWFs?

3.1 This is the most important stage in choosing the right MWFs, below they are 6 main factors to determine the product to meet customer requirements:

#1 Type of materials : Ferrous (Steel, mild steel, Iron etc) & Non-Ferrous (Aluminium, copper, stainless steel, titanum etc), others like ceramic, polymer, matrix composites (Aerospace part)

#2 Type of machine : CNC Machine center (Fanuc ,Brother etc), CNC turning(Mazak, Takisawa, Makino etc), CNC Auto lathe/swiss type (Citizen, Tsugami etc), CNC grinding : okamoto, Yasunaga etc), Broaching (Nachi etc)

#3 Most critical & heaviest cutting process : for example deep drill, small diameter drill or tap hole, parting (to create a drain) etc.

#4 Cutting speed : High speed >15,000 rpm, low speed <15,000 rpm

#5 Customer environment & health concern : working environment (a/c room?) and restriction on harmful chemicals or cause of carcinogenic etc

#6 Cost conscious : Per litre cost or total cost

#1 customer requirements scenario

1) Material Cutting : Aluminium block A6061 & A7075
2) Machine type/ speed : DMG mori machine center / average speed 30,000 rpm
3) Cutting process /time : milling & drilling / 6 to 7 hours /pcs
4) Working environment/ chemical content requirements: A/C working place / part is for medical used must not content Chlorine/sulphur/ and other harmful chemicals and easy to clean.

The coolant developed is synthetic glyco base coolant due to high speed and long machining time on the aluminium part, and secondary requirement is to easy clean after machining.

4.0 Case study on the above requirements coolant

KULIM 2023 STAGE 1 AVGO SYN-KOL 935-J-2 COOLANT TRAIL RUN REPORT SUMMARY

(06/03/2023 – 05/04/2023)

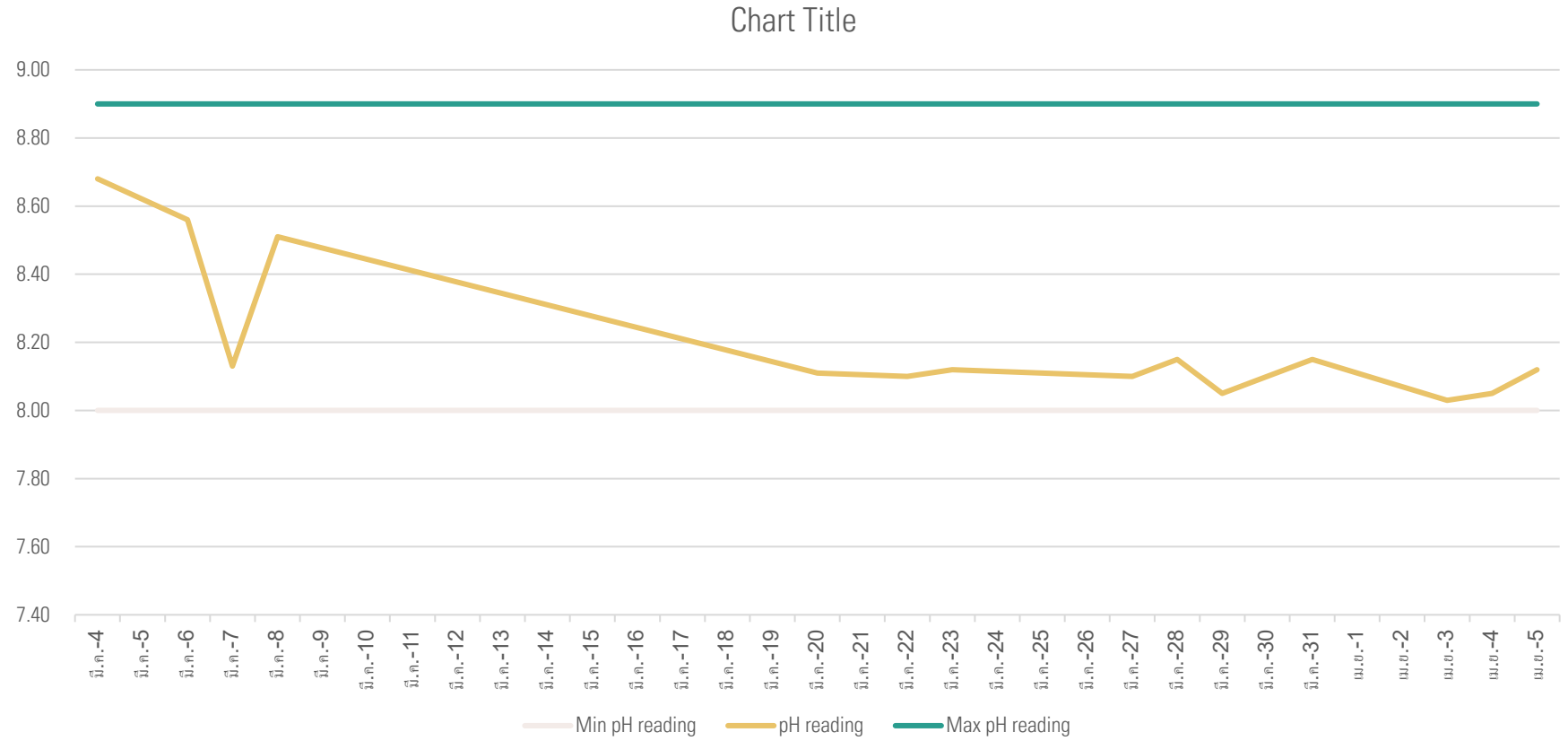
MACHINE NAME & UNIT NUMBER ON TEST : DMU 95 #23 (DMG MORI)

COOLANT TRIAL : AVGO SYN KOL 935-J-2

VENUE	JABIL KULIM
TESTING DATE	06/03/2023 – 05/04/2023
MACHINE NAME & NUMBER	DMU 95 #23 (DMG MORI)

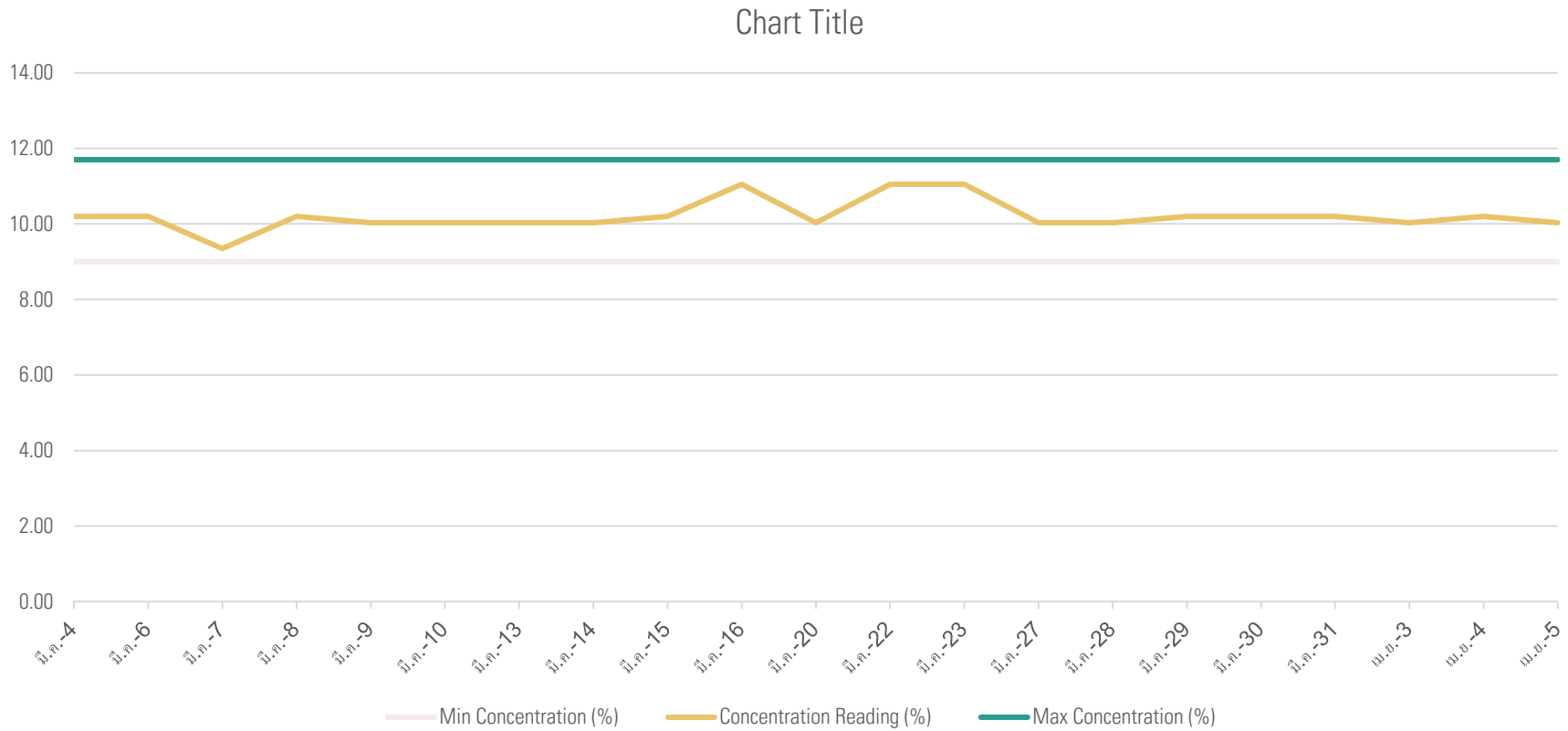
REPORT SUMMARY ON COOLANT TRAIL RUN FROM 06/03/2023 to 05/04/2023

NO	PARAMETERS	RESULTS	REMARK
1	No. of trial day	31 days	06/03 – 05/04/23
2	Production Volume	Morning Shift : 24 pcs	
		Night Shift : 25 pcs	
		Total : 49 pcs	
3	Coolant Volume	234.5 Litres	
4	Coolant Usage per product piece	4.79 Litres	
5	Coolant Cost per product piece	RM150.88	RM6300/Drum (200L)
6	Coolant Consistency	pH and Concentration	Refer to Index 1 & 2
7	Actual coolant Concentration (In tank)	10.35% (Lowest) 11.90% (Highest)	
8	pH coolant (In tank)	8.02 (Lowest) 8.68 (Highest)	
9	Foaming overflow	NO	
10	Water mark / corrosion on aluminium Jig	NO	Refer to Index 3
11	Rust on machine pilot table	NO	Refer to Index 4
10	Coolant Appearance	Transparent Towards White	Refer to Index 5



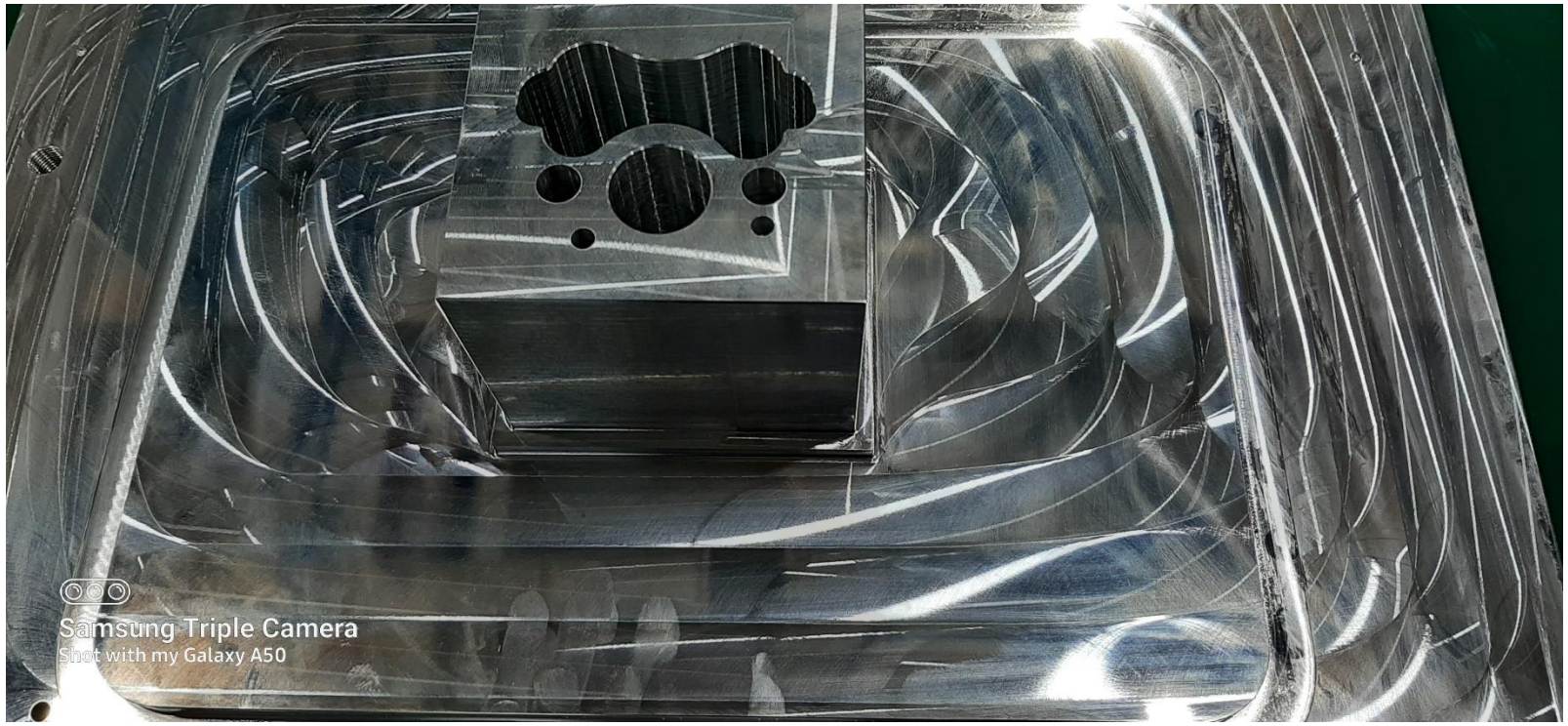
Index 1 – Ph reading throughout trial run from 4th Mac-5th Apr 2023

* The ph level is within the range 8 to 8.90



Index 2 - Coolant concentration reading throughout trial run from 4th Mac-5th Apr 2023

*the coolant concentration is stable within 9% to 12% actual concentration.



Index 3 – No water StAIN mark on aluminium jig

Index 4 – No Rust On Pilot table

Index 5 - AVGO SYN-KOL 935-J-2 Coolant Appearance

Q & A SESSION

Thank you

On behalf of AVGO's management, we wish you all best of luck and enjoy what you are doing.