Massecuite evaluation

MUIR B – June 2023

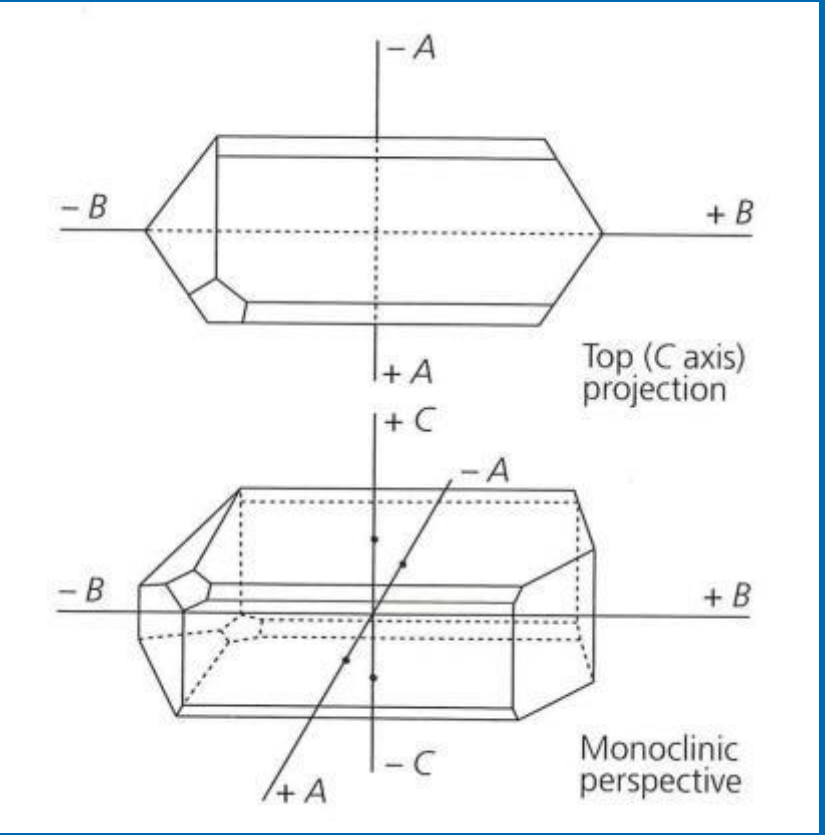
AGENDA

Objectives of sugar crystallisation

- Good crystals
- OK crystals
- Bad crystals

Methods for evaluation of sugar crystals

Methods for evaluaton of massecuite crystals



OBJECTIVES OF SUGAR CRYSTALLISATION

- Crystallised sugar within quality specifications
- Physical characteristics
  - Crystal size
  - Crystal size distribution
  - Few agglomerates
  - Free from fines
- Optimal molasses exhaustion
- Low sugar losses
- Optimal energy consumption
  - Low water usage

- Supersaturation
- Surface area

vdPoel et al (1998): 676

SAMPLING & SUBSAMPLING

CRYSTAL SIZE DISTRIBUTION

MEAN APPERTURE

Mean Aperture (MA) – aperture retaining 50% by weight of the sample (µm)

Coefficient of Variation (CV) – standard deviation of the distribution (% of MA)

$$MA = d_{50} = 0.49 \text{ mm}$$

$$CV = \frac{d_{16} - d_{84}}{2} \cdot \frac{100}{MA}$$

$$= \frac{0.68 - 0.30}{2} \cdot \frac{100}{0.49} = 39\%$$

Table 1
Example of particle size determination

Aperture size (mm)	% retained on sieve	Cumulative % retained
0.71	11.3	11.3
0.60	19.3	30.6
0.50	14.6	45.2
0.43	14.6	59.8
0.36	17.6	77.4
0.30	6.3	83.7
0.25	5.9	89.6
Base pan	10.4	100.0

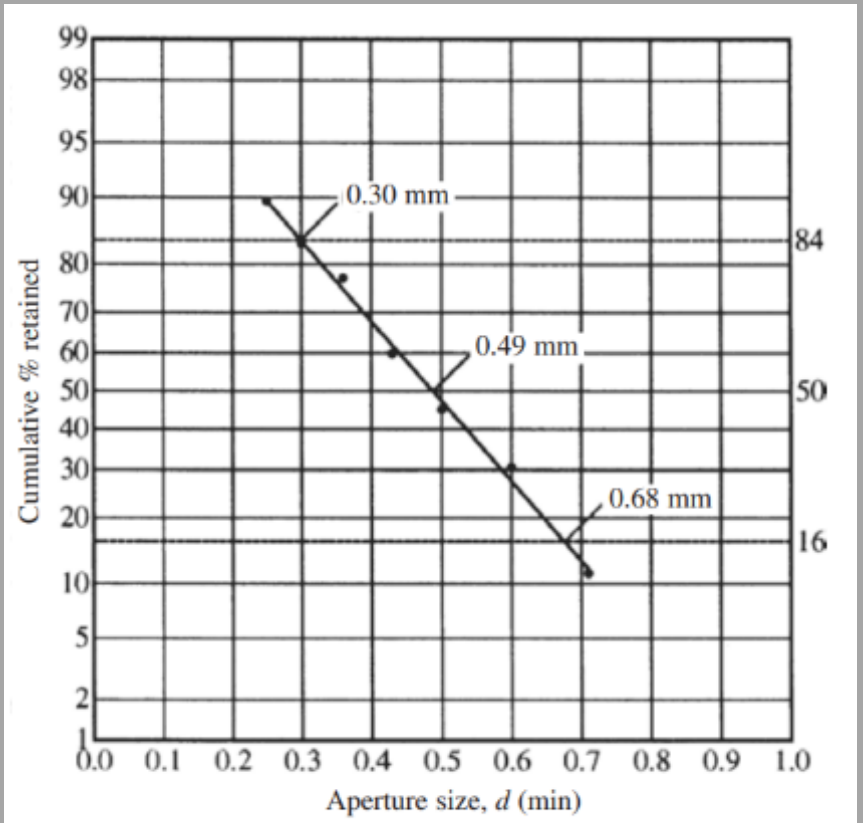
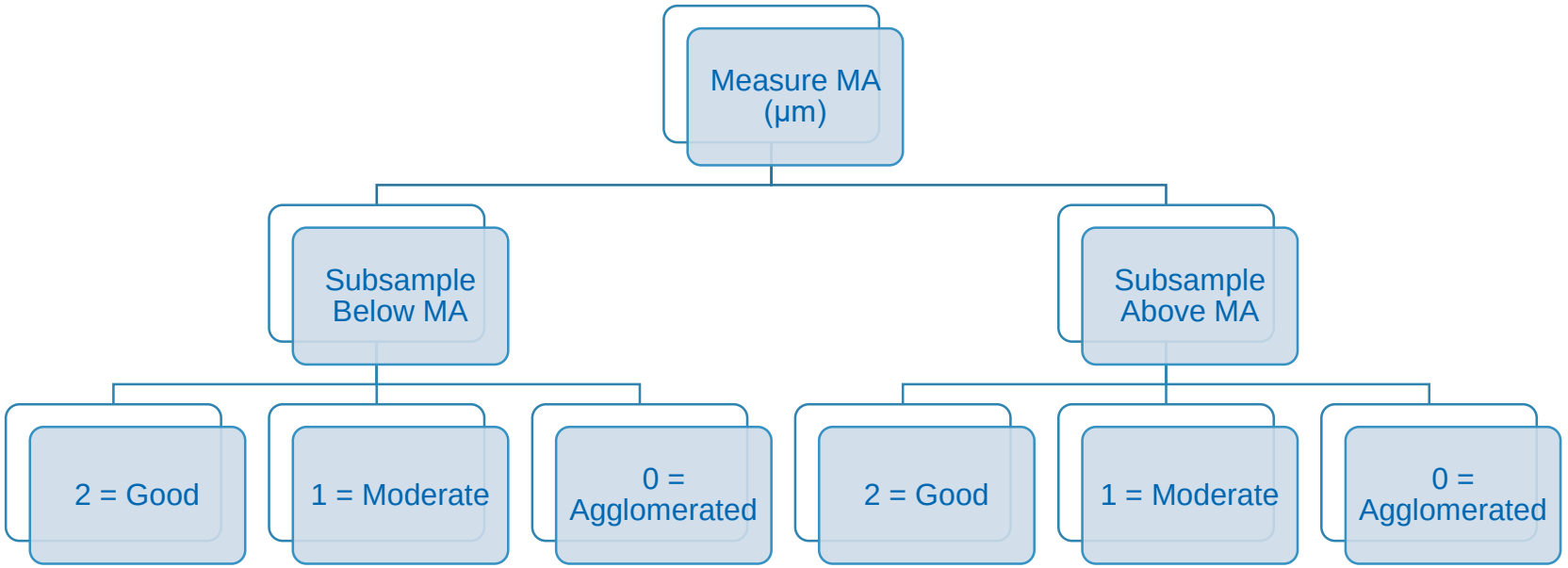


Figure 1. Powers method graph

ICUMSA Method GS2/9-37 (2007)

CRYSTAL REGULARITY INDEX (CRI)

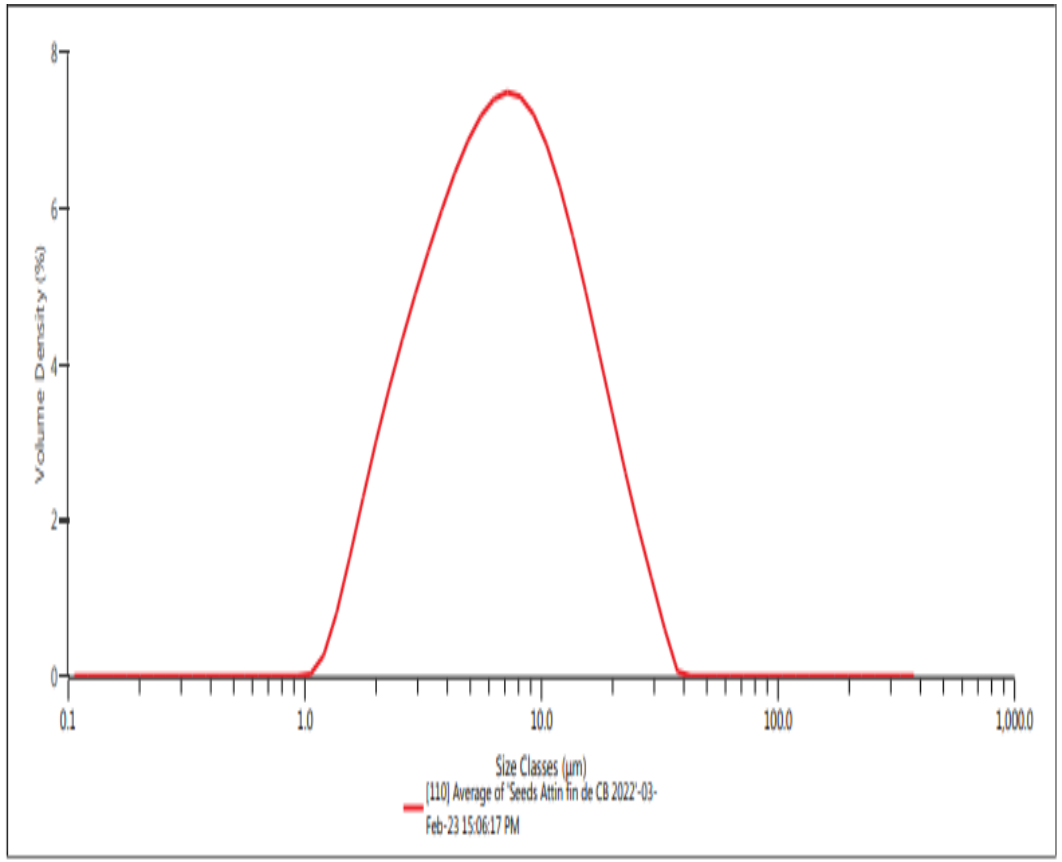
The Hill Notation (1965)



Perfect crystal	Crystal + twin	Agglomerate
2 pts	1 pt	0 pt

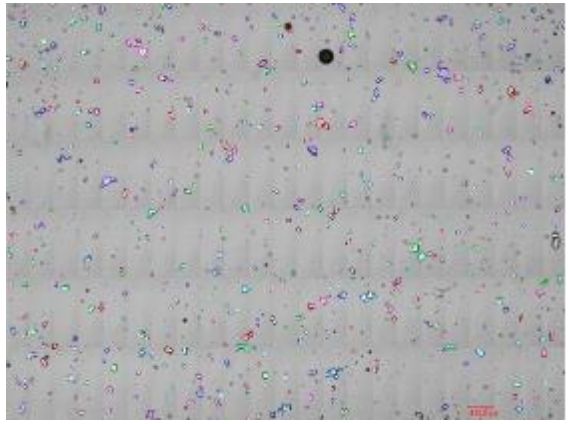
Notation [0-200]
Normal sugar [110-130]

LAZER PARTICLE SIZE ANALYSES

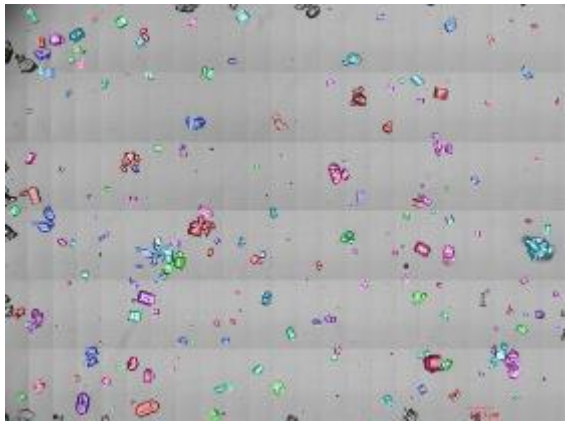


OFFLINE MICROSCOPE MEASUREMENTS

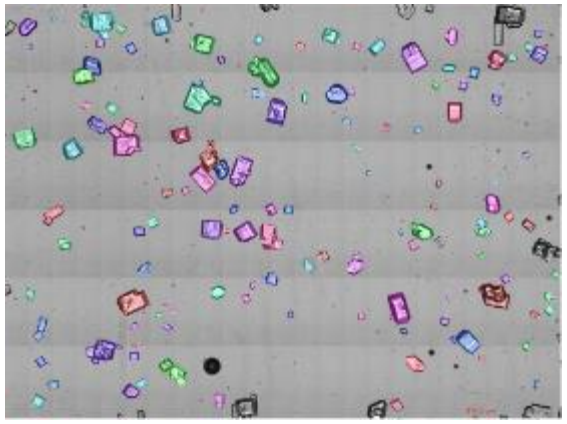
10 min



25 min

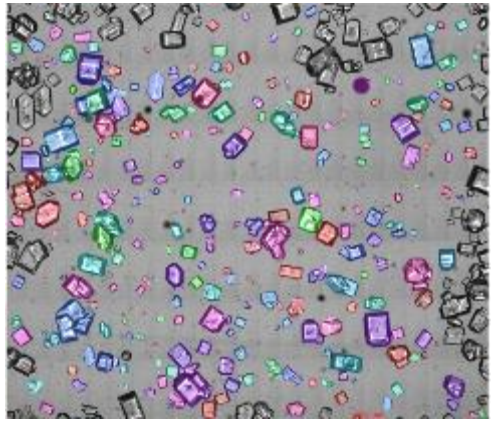


40 min

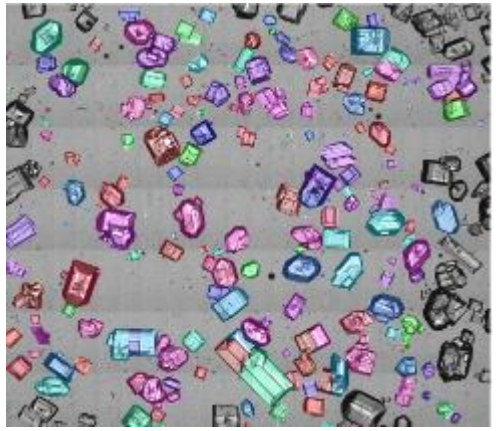


	10 min	25 min	40 min	1h30	2h	3h	End
MA (µm)	145	270	390	510	577	643	700
CV %	51	39	38	33	28	27	32

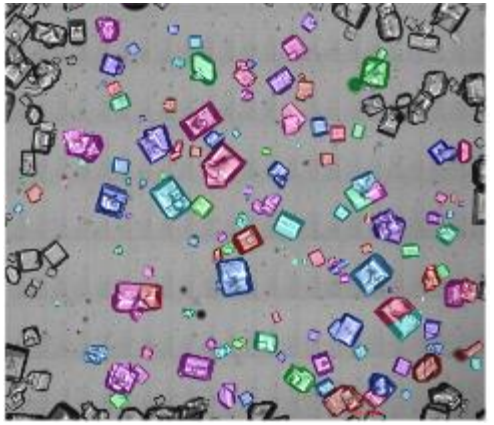
1h30



2h



3h



MASSECUITE SEPARATION AND SIEVING

PSD characterization
by sieving (MA, CV)

CONCLUSIONS

Analysis of sugar products after the fact

Evaluation of massecuite gives much more insight for problem solving

Methods need to be adapted to massecuite

There is a lot of information in the literature