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# AUTOMATIC FREEZING POINT TEST FOR AVGAS

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PAC LP

- Measure Freezing Point of Aviation Gasoline
- Preliminary data showing effects of aromatics and contaminants on freezing behavior



- Affect of Avgas contaminated with jet fuel
  - Customer issue
- Examined influence of aromatics on freezing point of Avgas

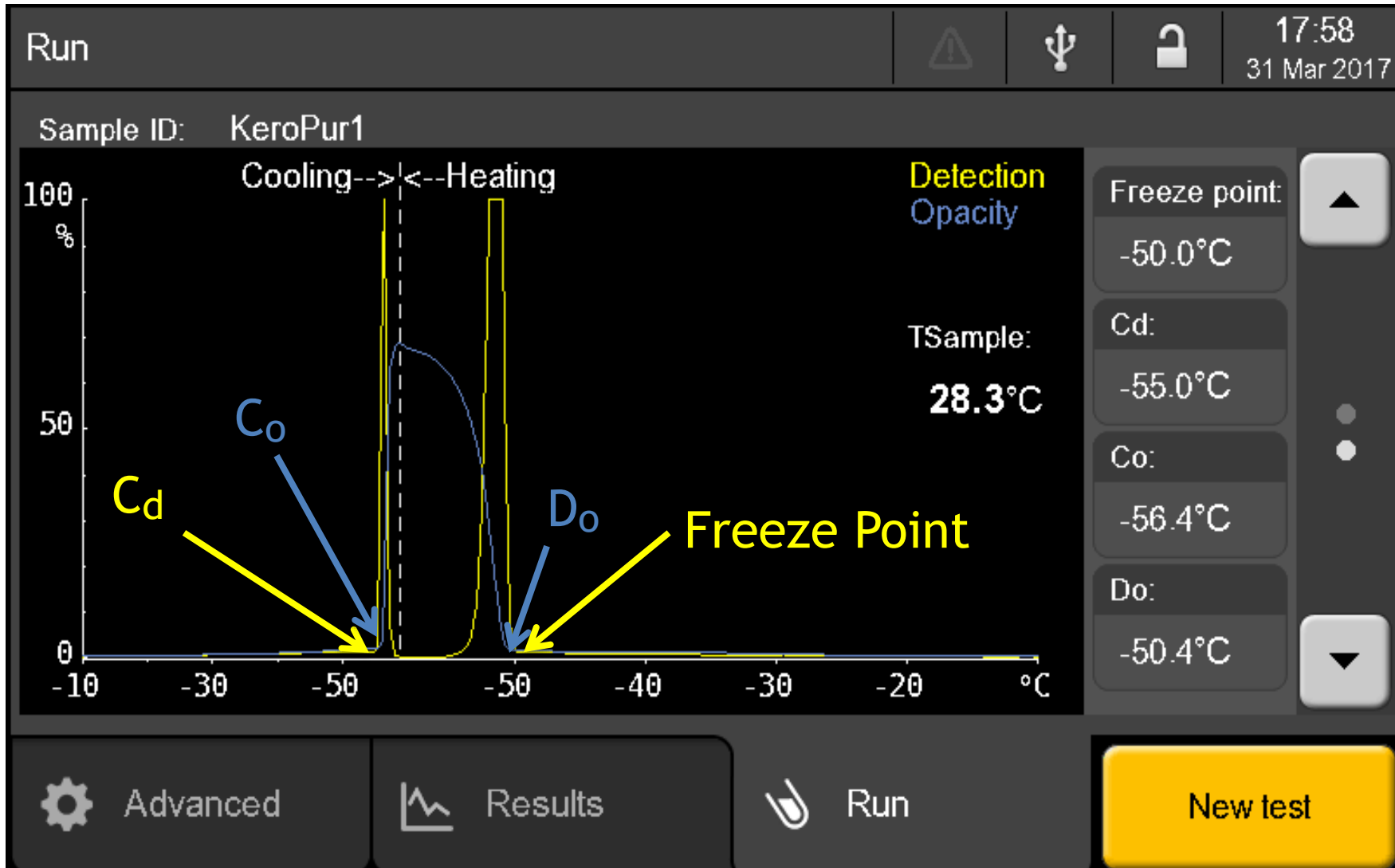


- Finding freezing point of Avgas is not mandatory
- Only note if no crystals are detected below -58°C
  
- \*\* Avgas can have freezing points lower than -100°C
- \*\* Some Avgas have freezing points at -70°C and still be acceptable Avgas

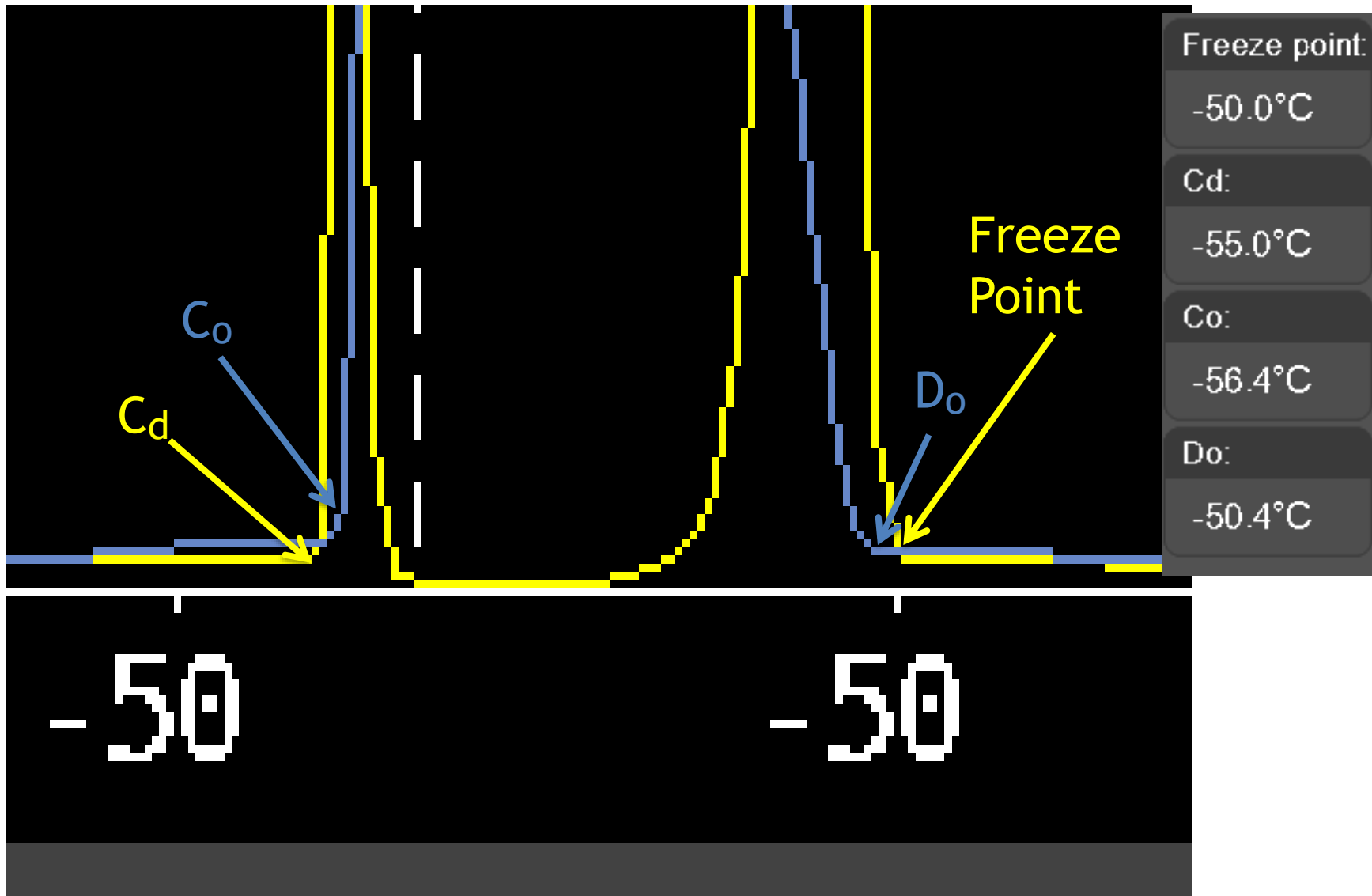
- Two detector system
- Nomenclature of the OptiFZP
  - Main Detector
    - Cd = temperature at which first crystals are detected
    - Freezing point - temperature which hydrocarbon crystals fully disappear
  - Secondary (Opacity) Detector
    - Co = temperature at which larger crystals are detected by the 2<sup>nd</sup> detector
    - Do = temperature at which disappearance is detected by the 2<sup>nd</sup> detector

Crystal Formation in Jet Fuel  
Detected by OptiFIP

# TYPICAL JET FUEL

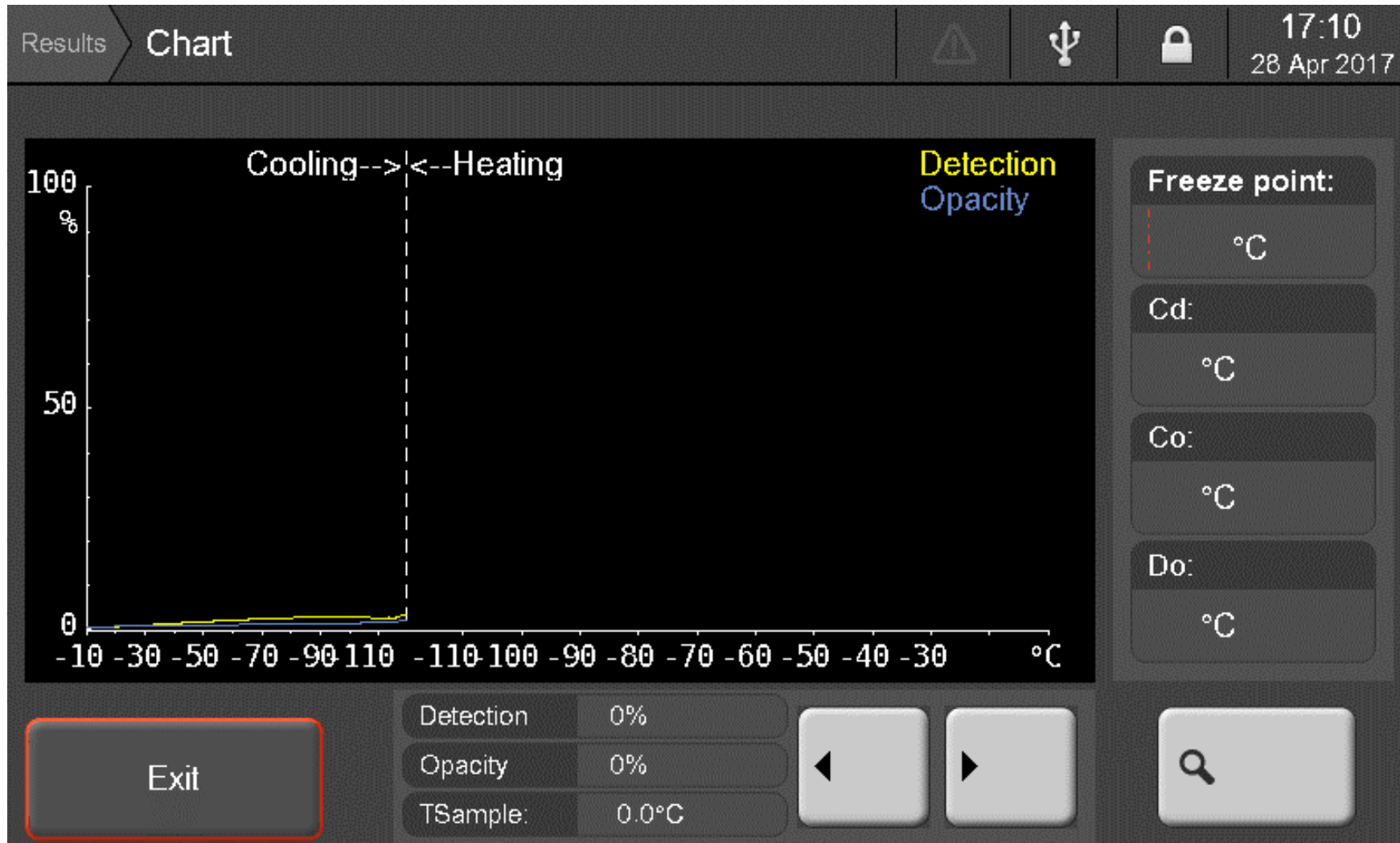


# JET FUEL





# TYPICAL AVGAS



# TYPICAL AVGAS



Results ⚠️ 🔌 🔒 17:10  
28 Apr 2017

Test Parameters	Result
Operator: SU	<b>Crystal. not detected till:</b>
Sample ID: AvGas-170404-03	<b>-120.0°C</b>
Product: ASTM D7153	Cd: °C
Performed: 05 Apr 2017 11:03	Co: °C
Ending: Stop temperature	Do: °C
Cycle/Res: 1 / 1	Note:
Warning: 0x00000000	
r0000108	

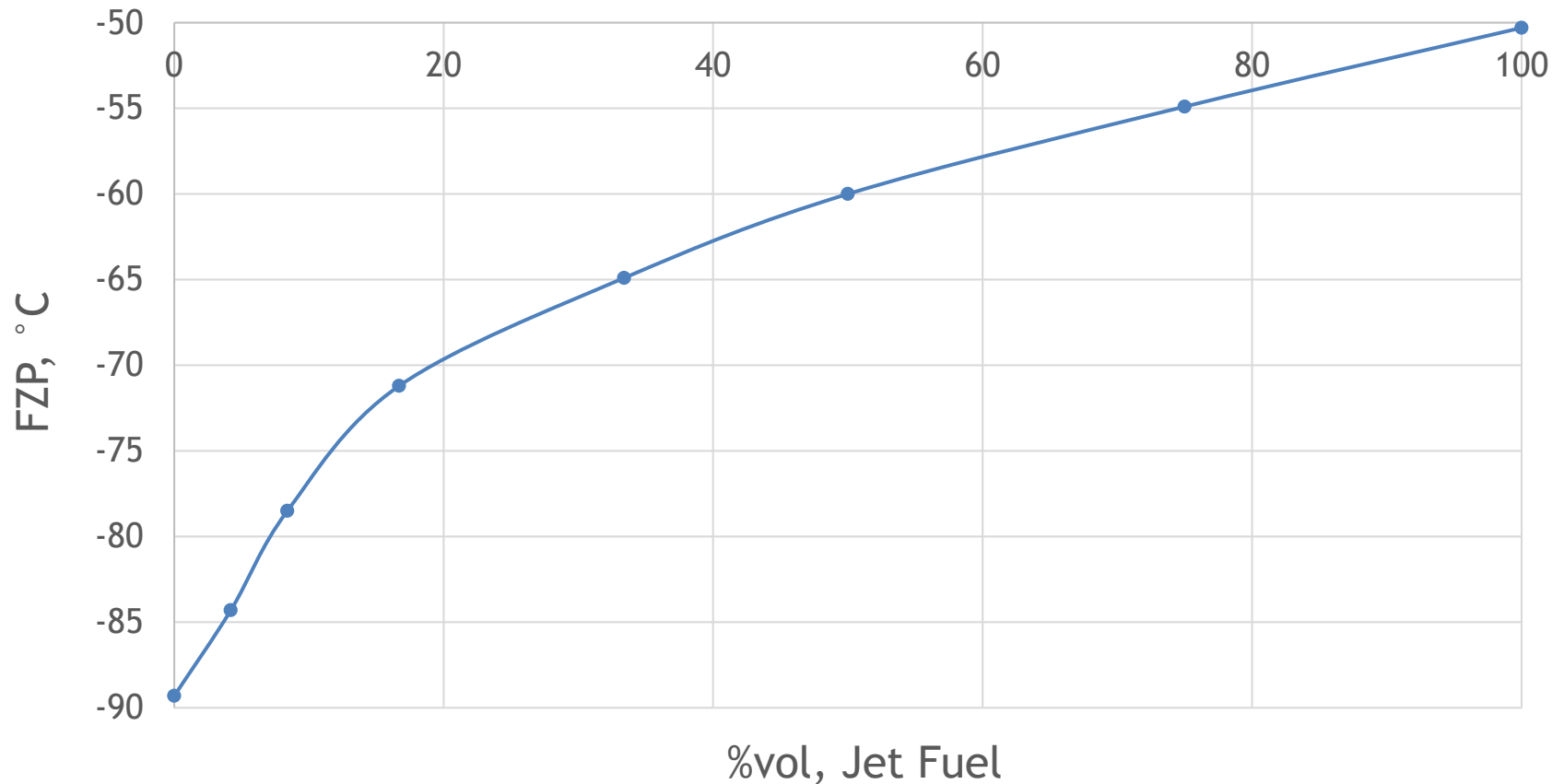
108  
129

**Exit** Print Chart Validate

# Jet Fuel in Avgas (customer data)

<b>“Base Av Gas”</b>	<b>“Impurity”</b>	<b>FZP - D7153</b>
Av Gas (%vol)	Jet Fuel (%vol)	Result (°C)
100	0	-89.3
95.8	4.2	-84.3
91.6	8.4	-78.5
83.3	16.7	-71.2
66.6	33.4	-64.9
50	50	-60.0
25	75	-54.9
0	100	-50.3

## FZP (ASTM\_D7153) of Avgas depending of impurity (JetFuel)

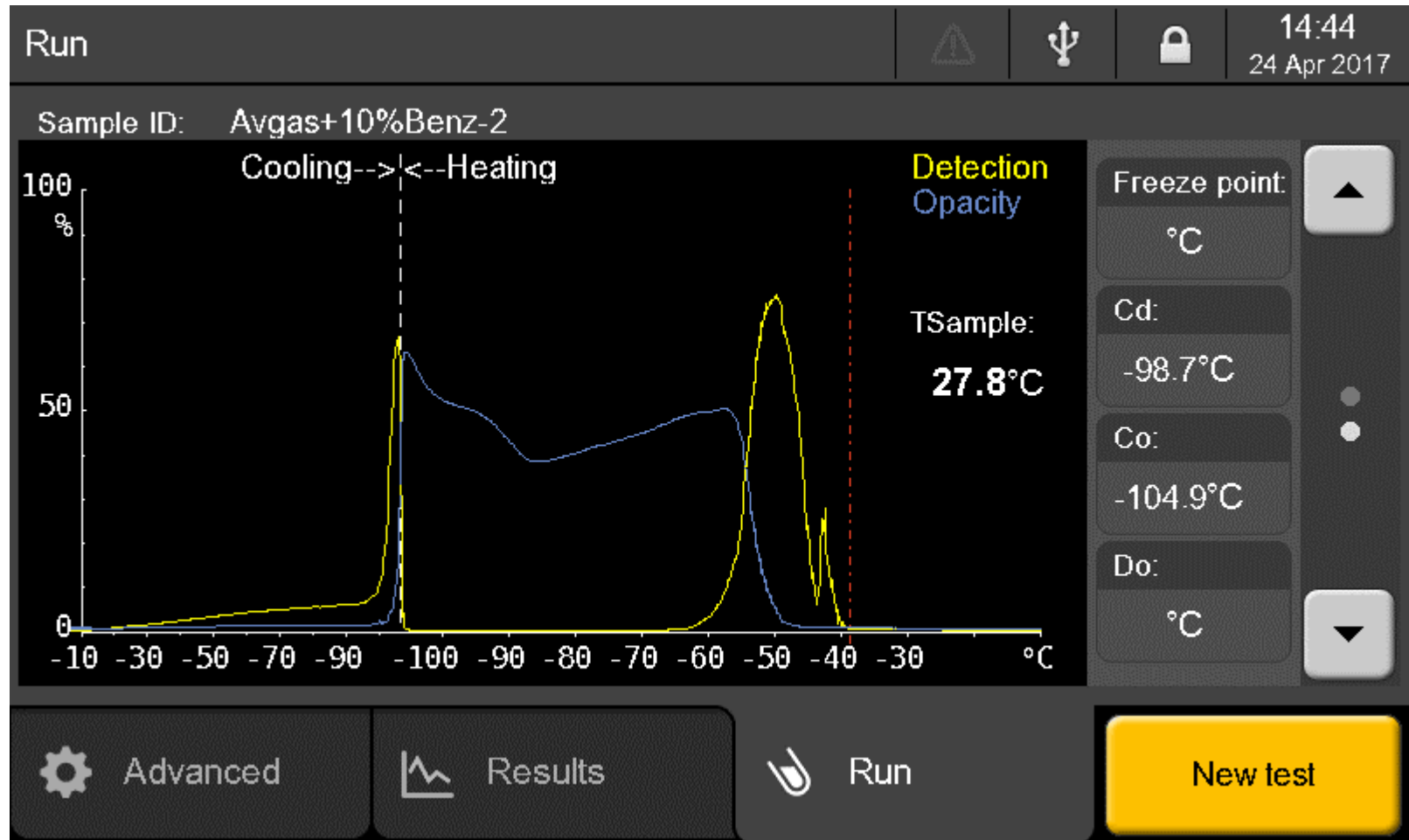


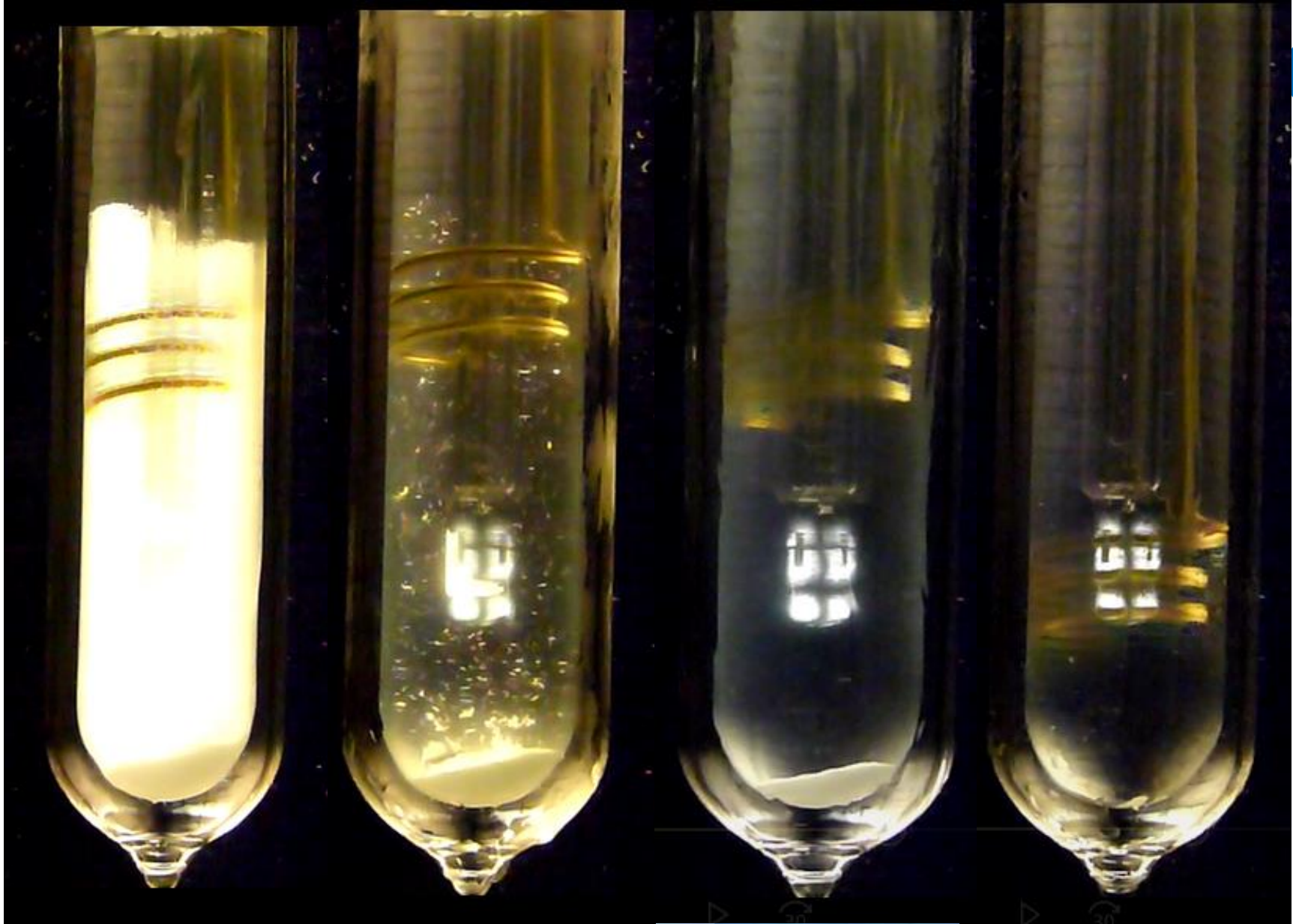
Slope of 1.2 °C/% of impurity

- Customer can easily determine if his Avgas has 1% or higher jet fuel
- \*\*Must compare Avgas before transferring to storage tank with the sample after storage

- Examined effect of large amount of aromatics
  - Benzene

# 10% BENZENE IN AVGAS





-61.6

-56.0

-43.8

-21.6



1. Very large difference in freezing/melting of high aromatics in Avgas (freezing  $-80^{\circ}\text{C}$  / melting between  $-60^{\circ}\text{C}$  and  $-30^{\circ}\text{C}$ )
2. Crystal (solid) density significantly higher than density of the liquid
3. Stirring in manual test not enough to agitate crystals

\*\*Avgas starts freezing at  $-80^{\circ}\text{C}$  with stirring and  $-100^{\circ}\text{C}$  without stirring

- As expected, blends of Av Gas/Jet, Av Gas/diesel, Av Gas/high aromatics, affect freezing point
- Super cooled solutions of heterogeneous blends of high amounts of aromatics (xylene & benzene) produce crystals which have broad melting temperature behavior
- Current manual method, according to procedure D910, not capable of detecting freezing point of AV Gas with heavy aromatic contamination

- Questions?