



## Viscosity Application Refineries

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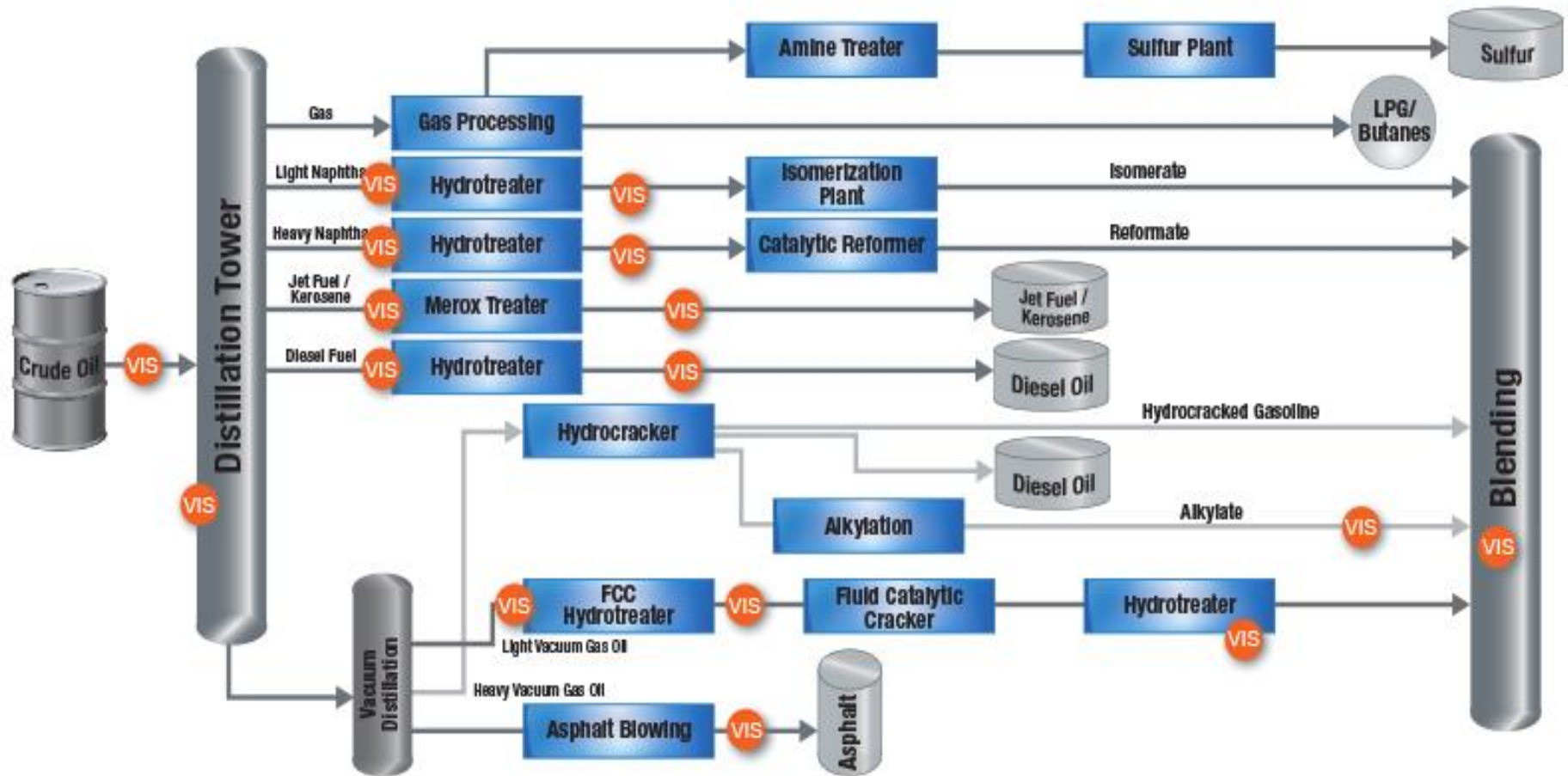
# Role of Viscosity in Refineries – Overview



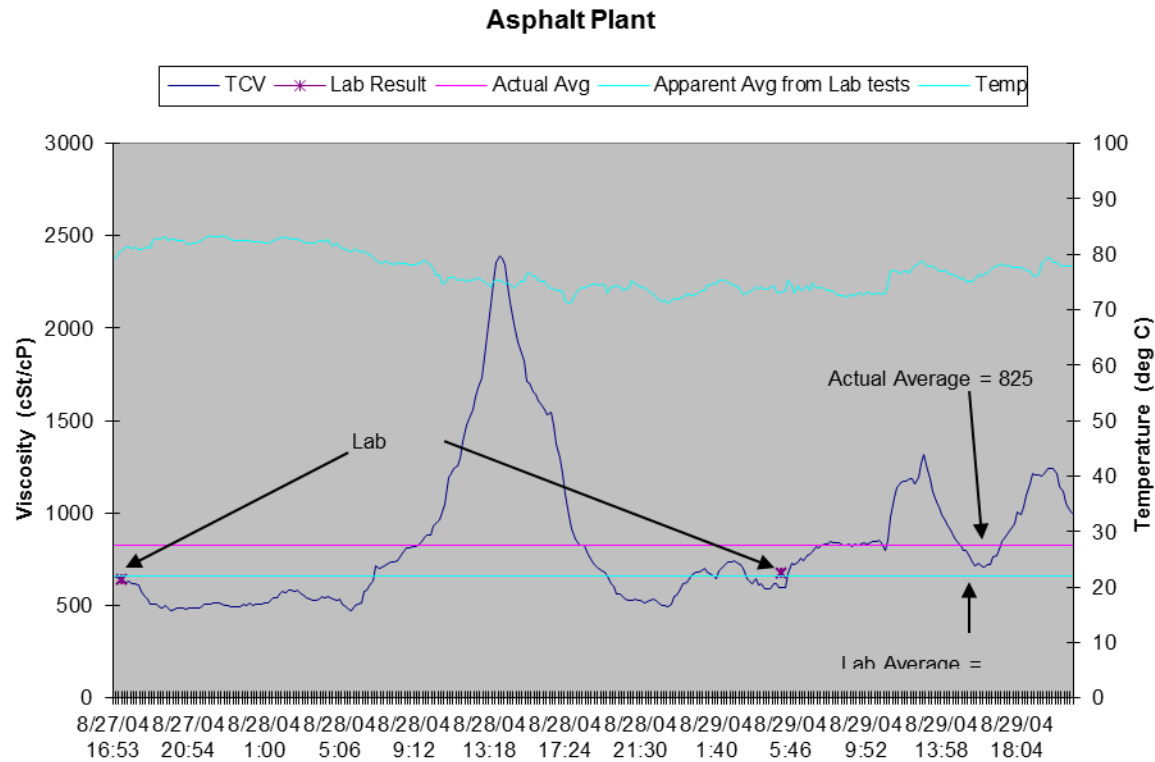
- **Viscosity** is a critical measurement for refineries
- Virtually all customers buy refinery products by their viscosity grades, based on internationally accepted ASTM
- D445 lab measurements, performed
  - periodically in-process
  - final quality verification
- Unfortunately, production varies substantially between lab measurements, achieving customer specifications requires post-refining blending

**In-line real time measurements substantially improve viscosity control, thereby reducing refinery costs and improving throughput**

# Refineries Are Complex Operations



# Periodic Lab Measurements are Inadequate for Process Control



**NOTE: Lab readings shows process “in spec” .....But the resulting storage tank is not !!!**

**Lab average data = 628 cSt. Actual average = 825 cSt. A 26% difference !!!**

## Viscosity drives in-line blending to hit quality targets efficiently

- Maximize production
- Minimize diluent
- Eliminate reprocessing

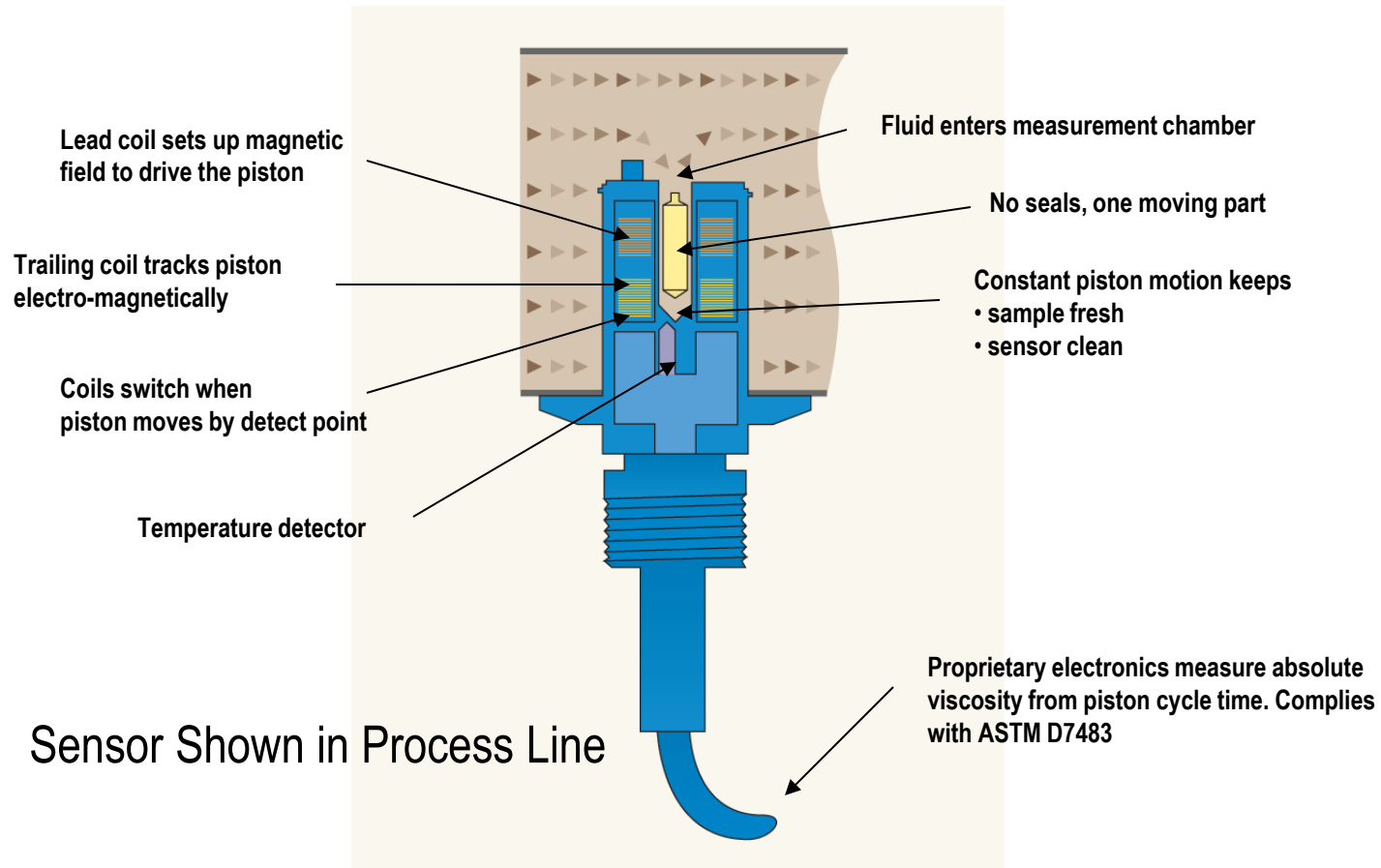


## Monitor process with

- ASTM consistent instrumentation > correlation primary test method
- Provide fast and robust results
- Lower maintenance costs – self cleaning sensors

***Oscillating Piston Method uses the same technology for lab & process – all ASTM consistent, producing accurate and repeatable results***

# Oscillating Piston Measurement Technique

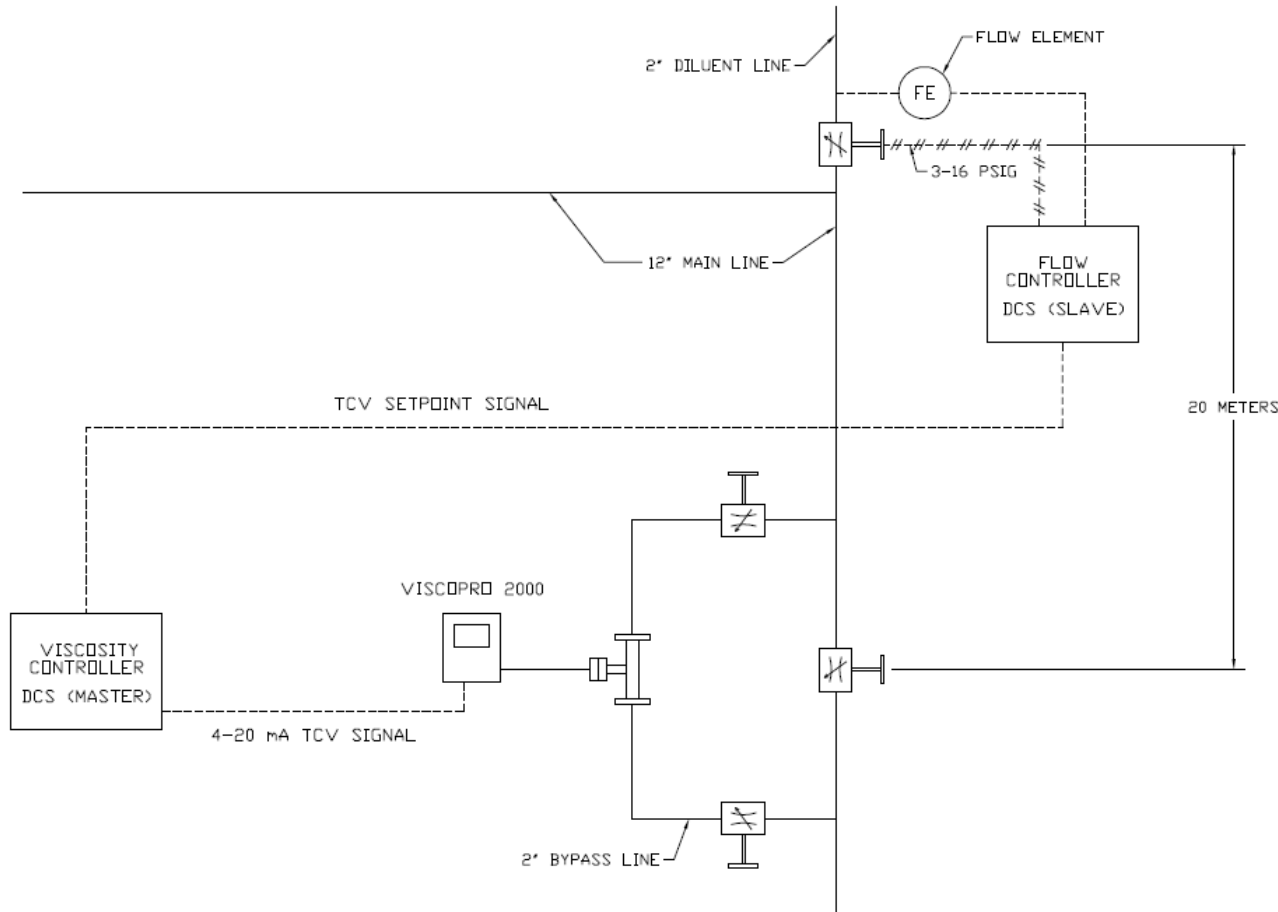


## Installation Overview

- Installed in bypass lines with conditioning to meet lab results:
  - flow control
  - temperature control (insulated, heat traced, etc.)
  - particulate filtering (in some cases)
- Controlling temperature is essential for accurate viscosity information
- Temperature compensated viscosity (TCV) is used if process temperature is different from lab)



# Typical Process Flow Diagram



- Bypass line uses delta pressure valve to ensure flow
- Viscometer output controls set point of the diluents flow control
- Distance between control valve and sensor creates lag time and requires tuning on DCS
- All bypass lines are heat traced & insulated



# CVI in Refinery Monitoring Asphalt



## Flexibility of implementing sensors



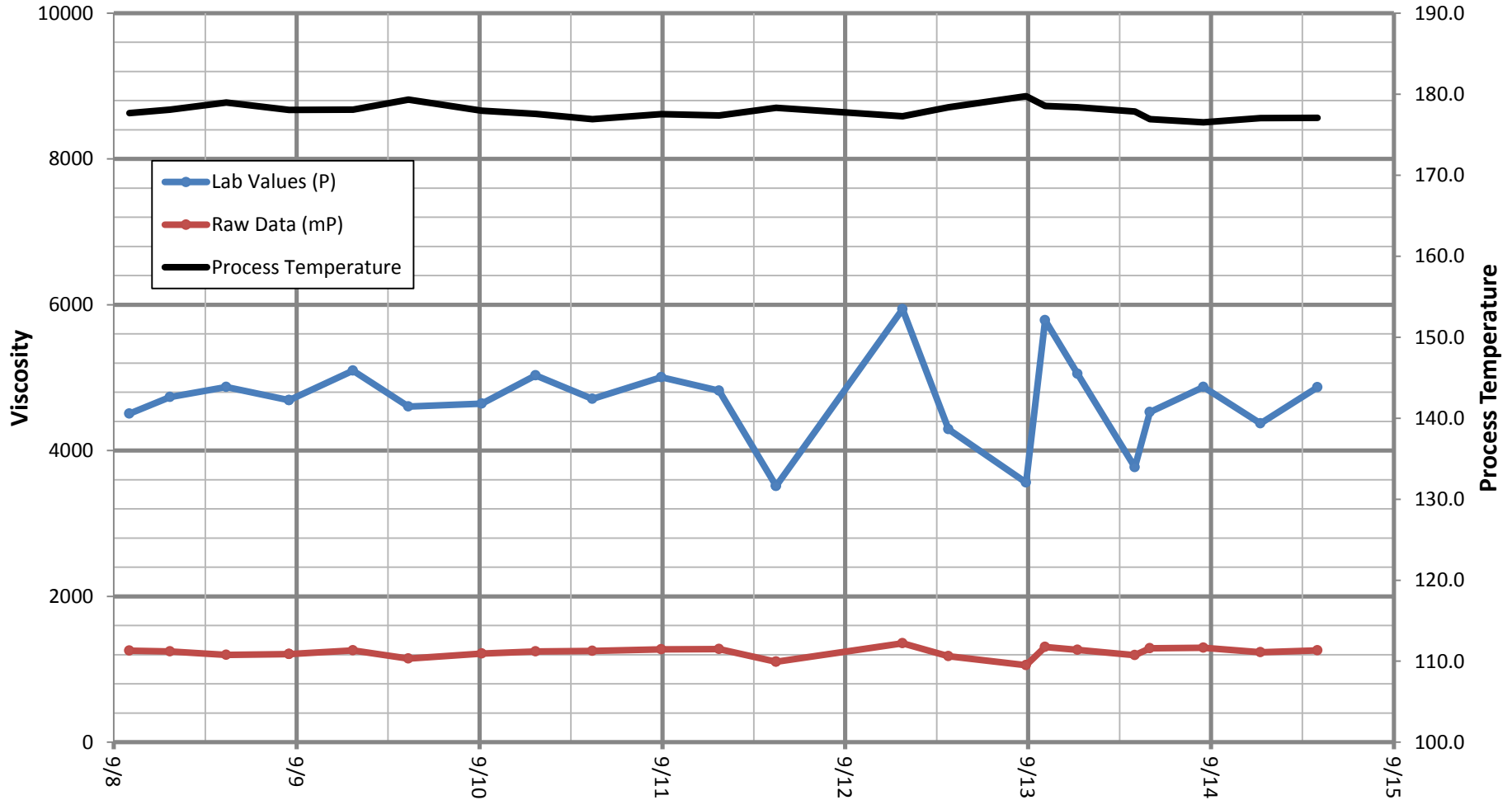
### Sensor bypass line

Insulated & heat traced for temperature control – essential for accurate viscosity information

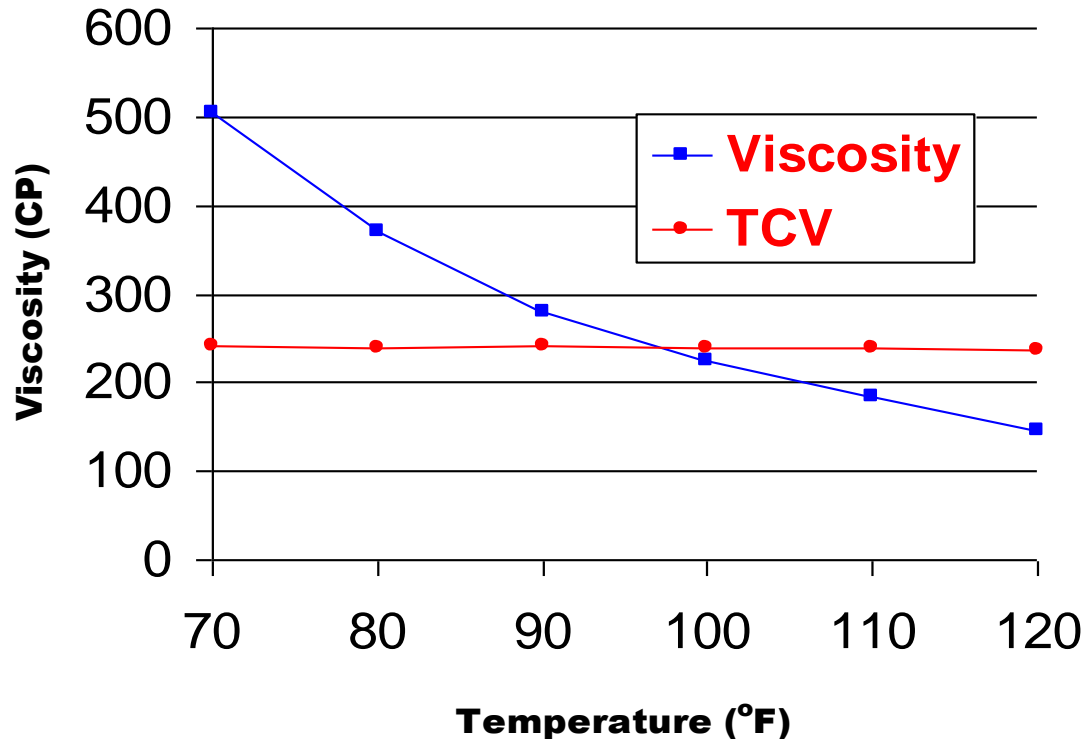


### Sensor in byPass line with flushing ports

# Asphalt Viscosity Data -

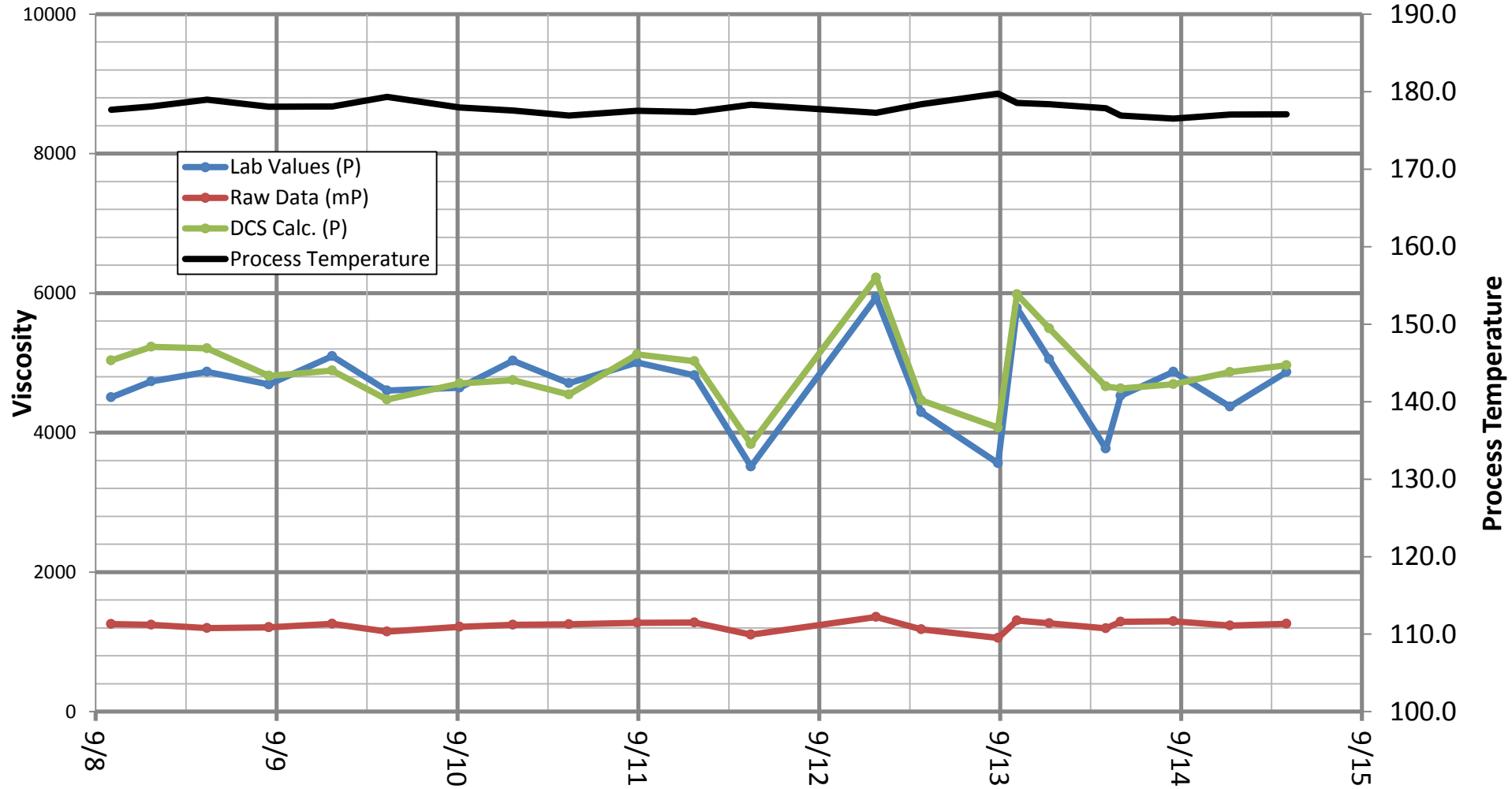


# Temperature Compensated Viscosity (TCV)

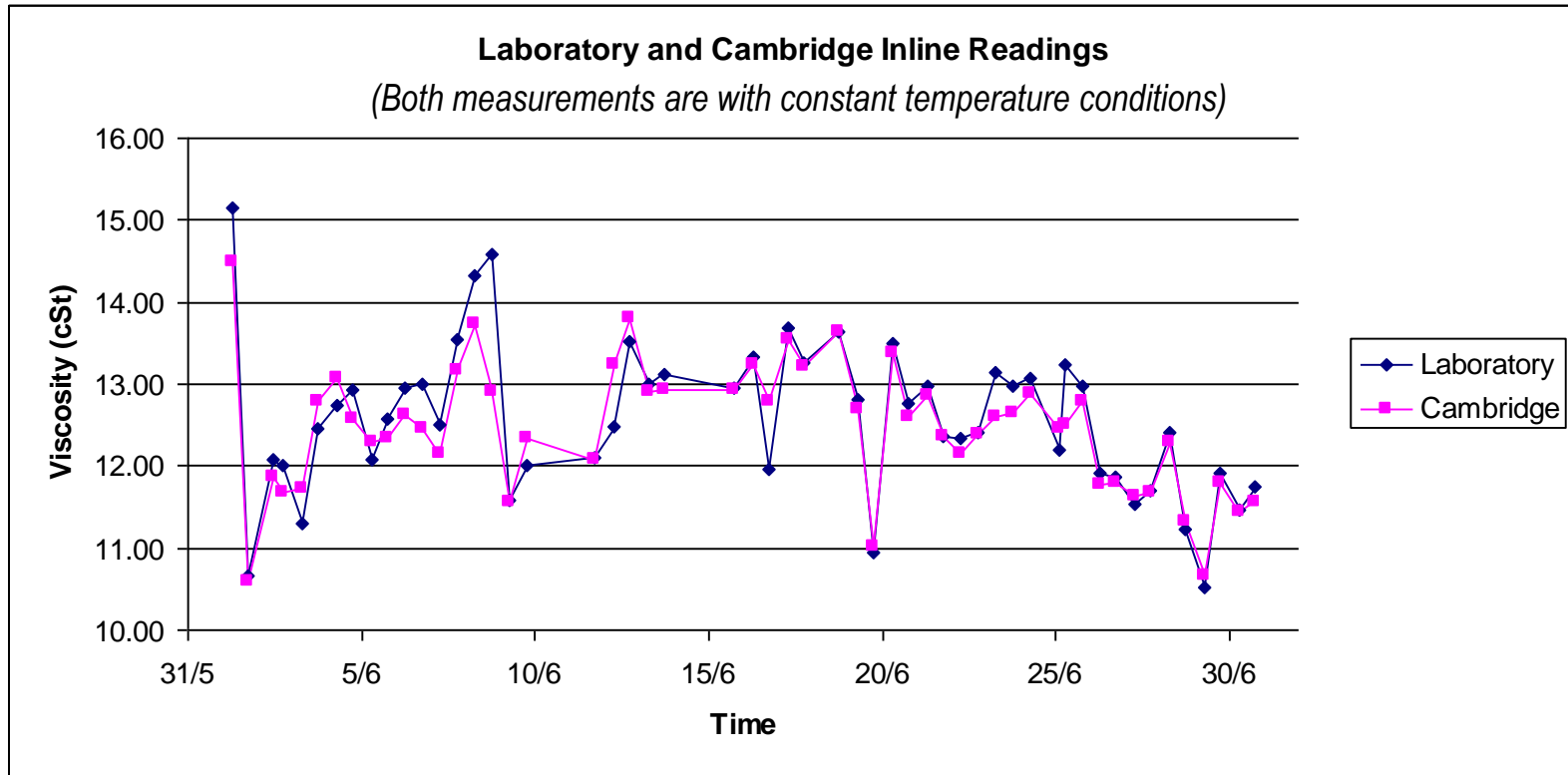


- Temperatures in production environments are often not controlled
- Temp swings can cause fluid to have different viscosity values
- ASTM D341 curves can be programmed into the VISCOpro
- TCV enables operators to despite temperature swings

# TCV Applied



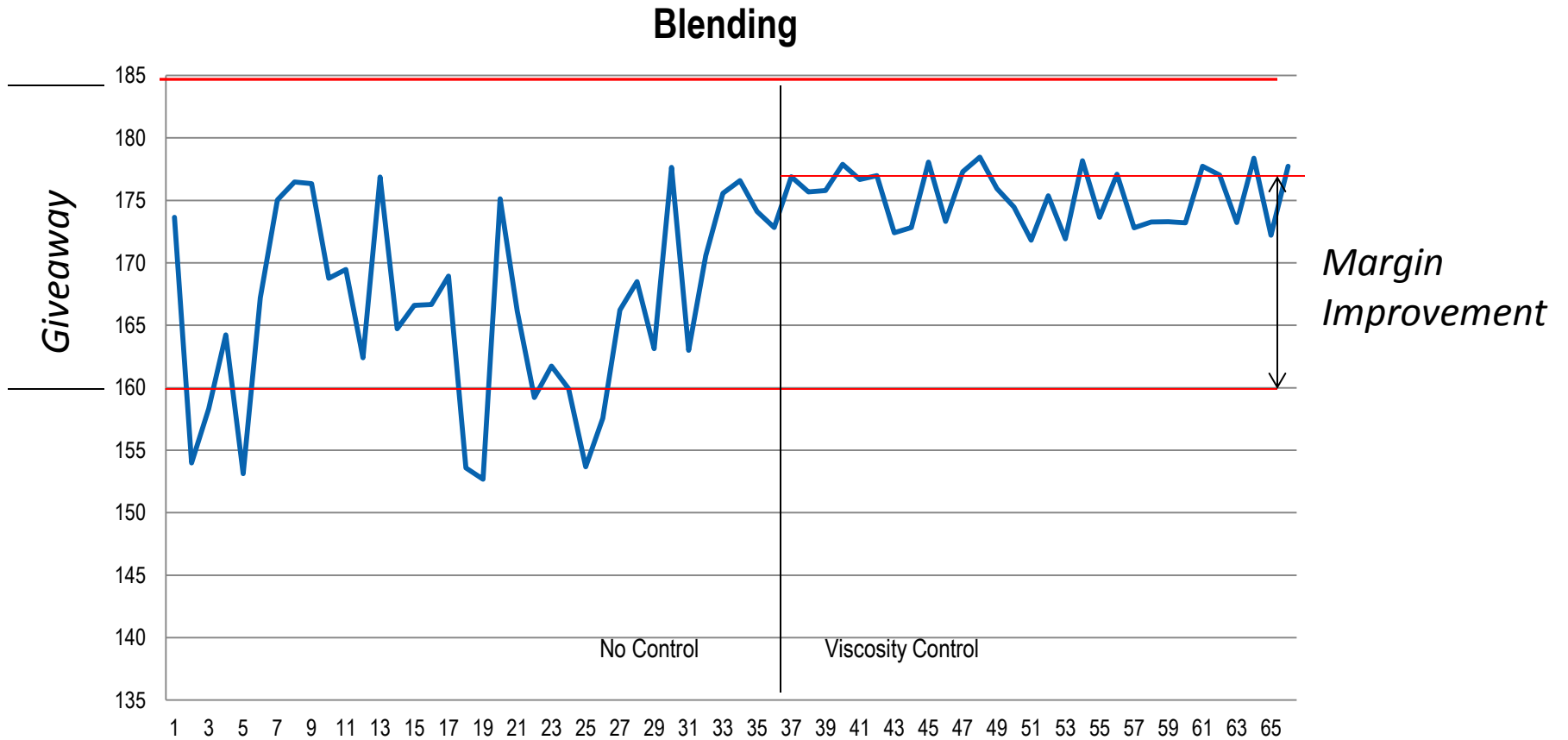
# CVI Process & Lab Data Tracks



**High correlation to lab ASTM results**



# VISCOpro Tracking



# Benefits



- Minimize the production of off specification material during “product run down”
- Minimize use of diluents in blending
- Avoid off specification events with information between laboratory tests
- ROI can easily be achieved in DAYS



# Real Time Measurements Compliment Laboratory



- Internationally accepted lab tests are required
- Real time data monitoring
  - Extends laboratory analysis
    - Lab is a snap shot
    - Real time monitoring is a continuous view
  - Improves Quality Control
  - Reduces testing demand on labs: labs can be used only for final QC



Results = improved process efficiency from tight viscosity control



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