

Introduction

There are more than 700 refineries world-wide with a capacity for 82 million barrels of oil per day. A barrel of crude yields gasoline, fuel oil, jet fuel, diesel, asphalt, lubrication oil and other refined products, but actual output varies dramatically by refinery. Demand for energy continues to rise along with pressures on producers to streamline and speed production, increase yield and operate more efficiently. Viscosity is one of the most critical measures of product quality for virtually every refinery product. New developments in viscosity measurement are enabling refineries significant improvements in production quality, cost and output.



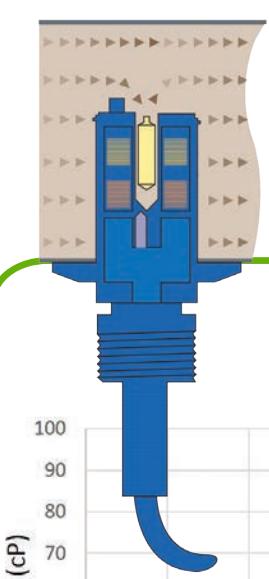
Common Process Viscosity Methods



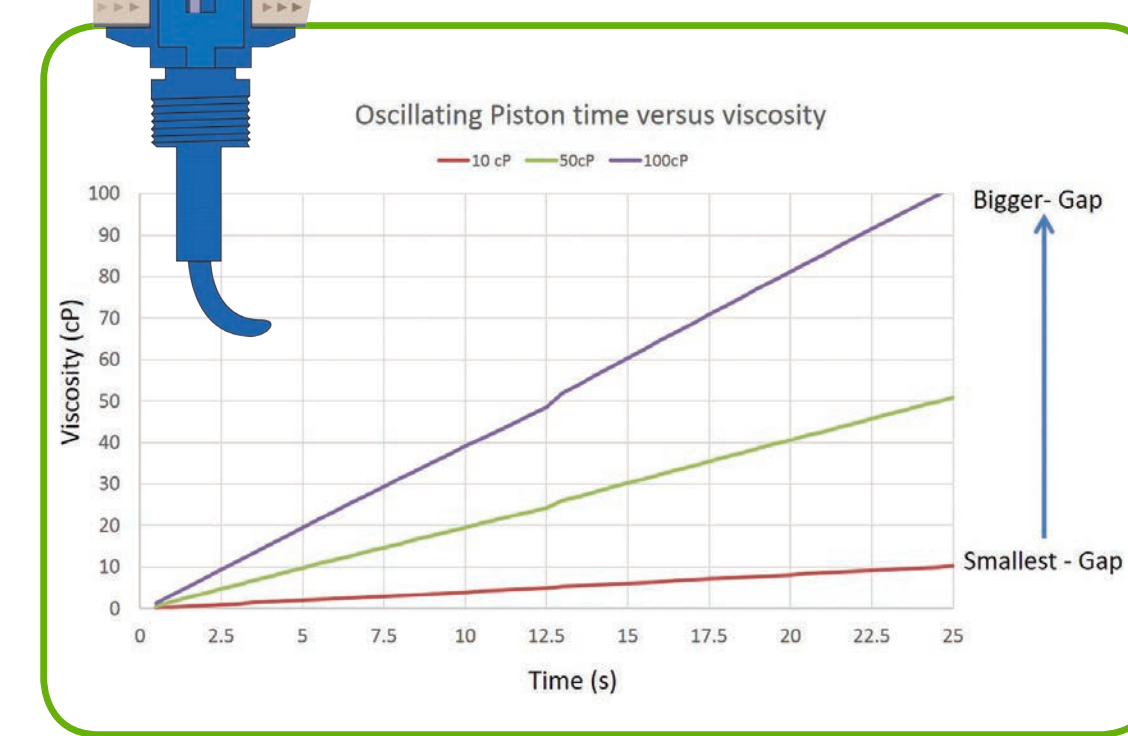
D445 METHOD - CAPILLARY TUBE

- Primary test method
- Provides a snapshot into the process
- Key events can be missed
- Need a better measurement for process viscosity

CAPILLARY
Uses high-precision pumps for accuracy, but requires frequent and costly maintenance



D7483 METHOD - OSCILLATING PISTON

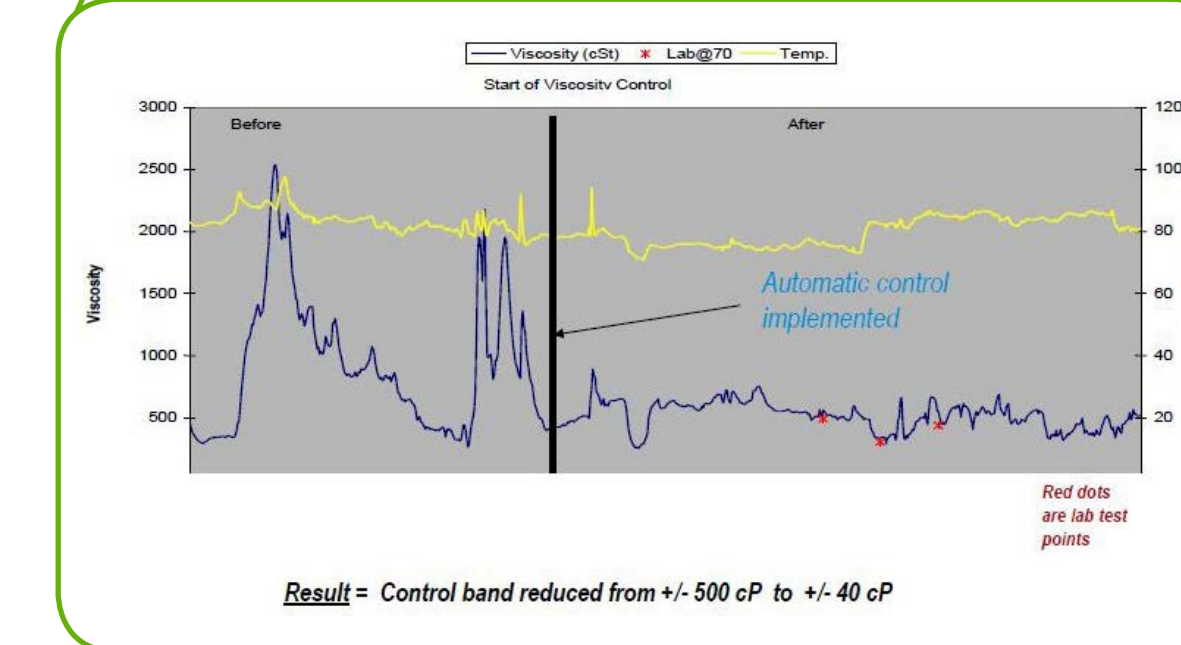
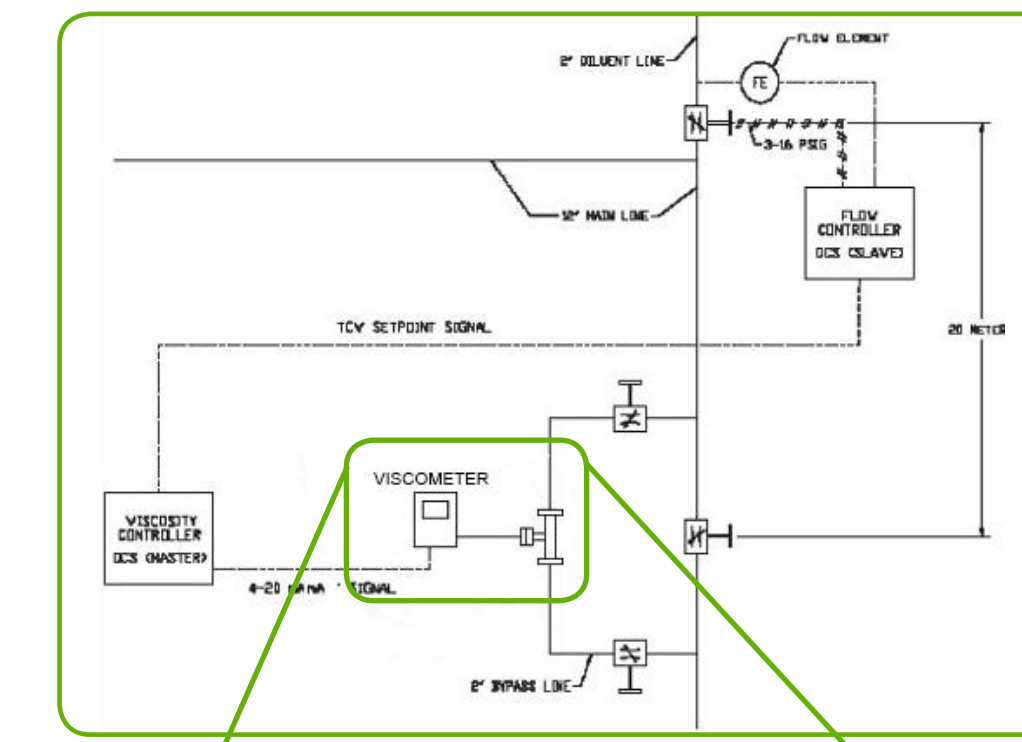


- Three Components of Drag
- Profile Drag - Stokes
 - Surface Drag - Newton
 - Annular Flow - Poiseuille
- Surface Drag dominates in the oscillating piston

OSCILLATING PISTON
Uses a magnetically influenced piston. Preferred for its robustness and reliability. Limited dynamic range.

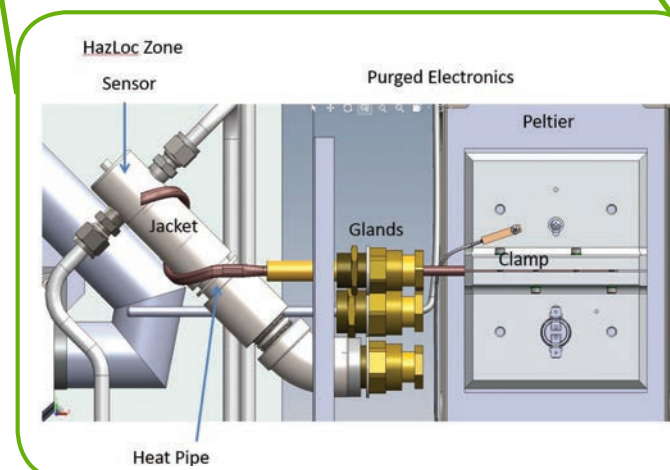
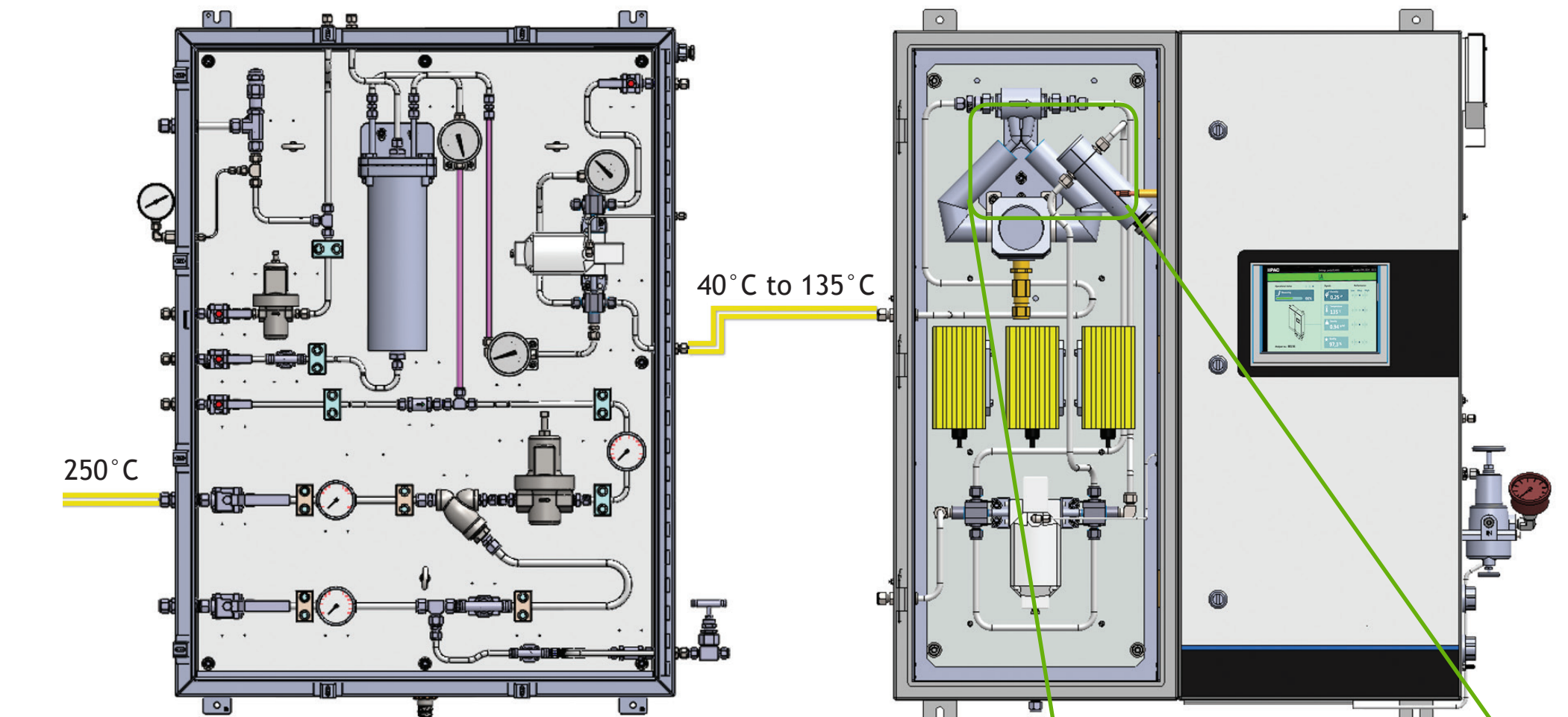
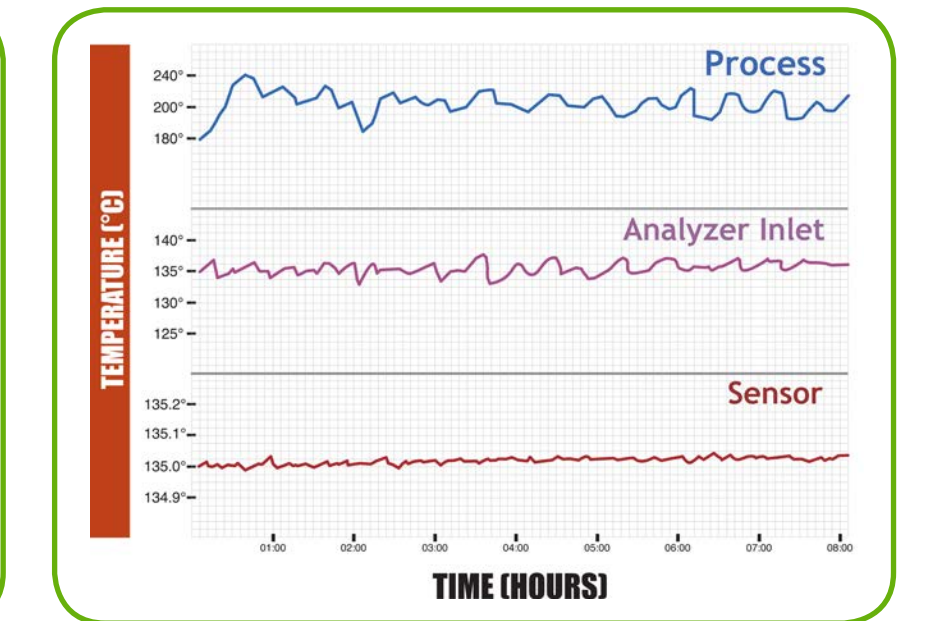
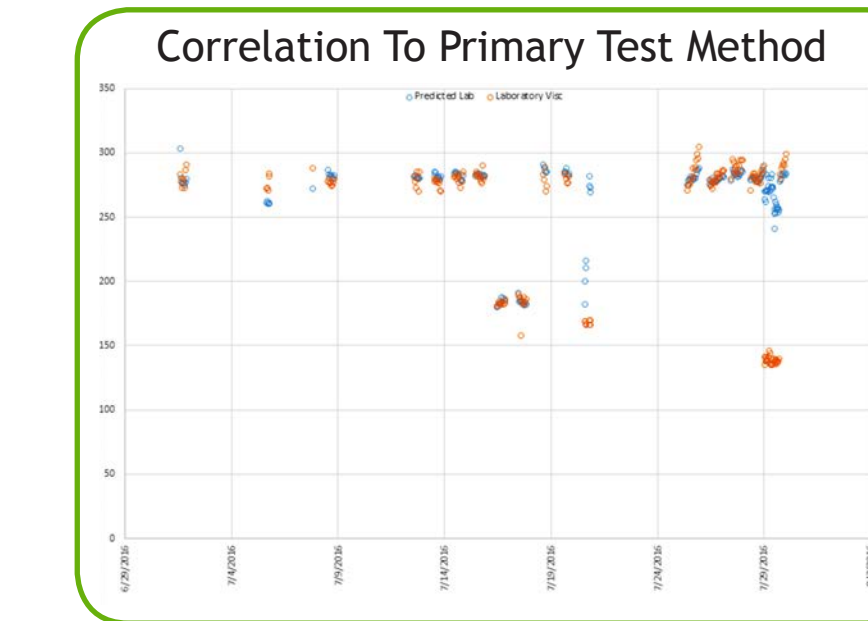
Process Viscosity Monitoring

- Ideal for process control
- Measures viscosity at process temperature

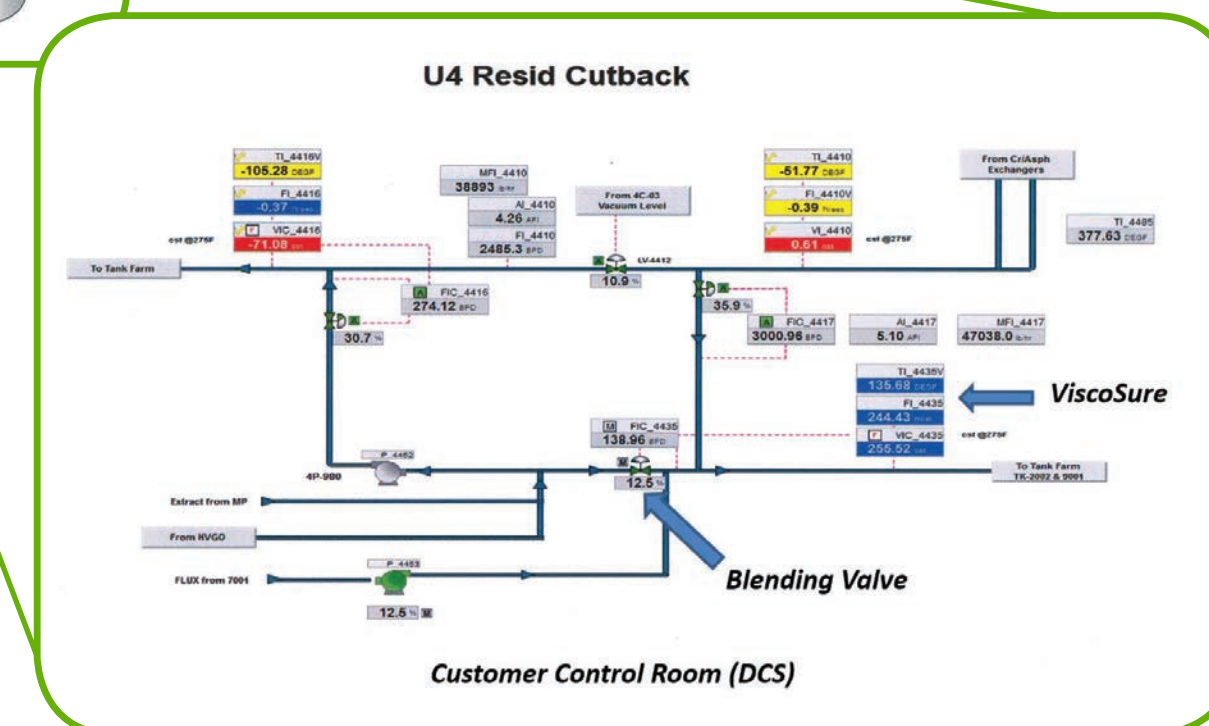
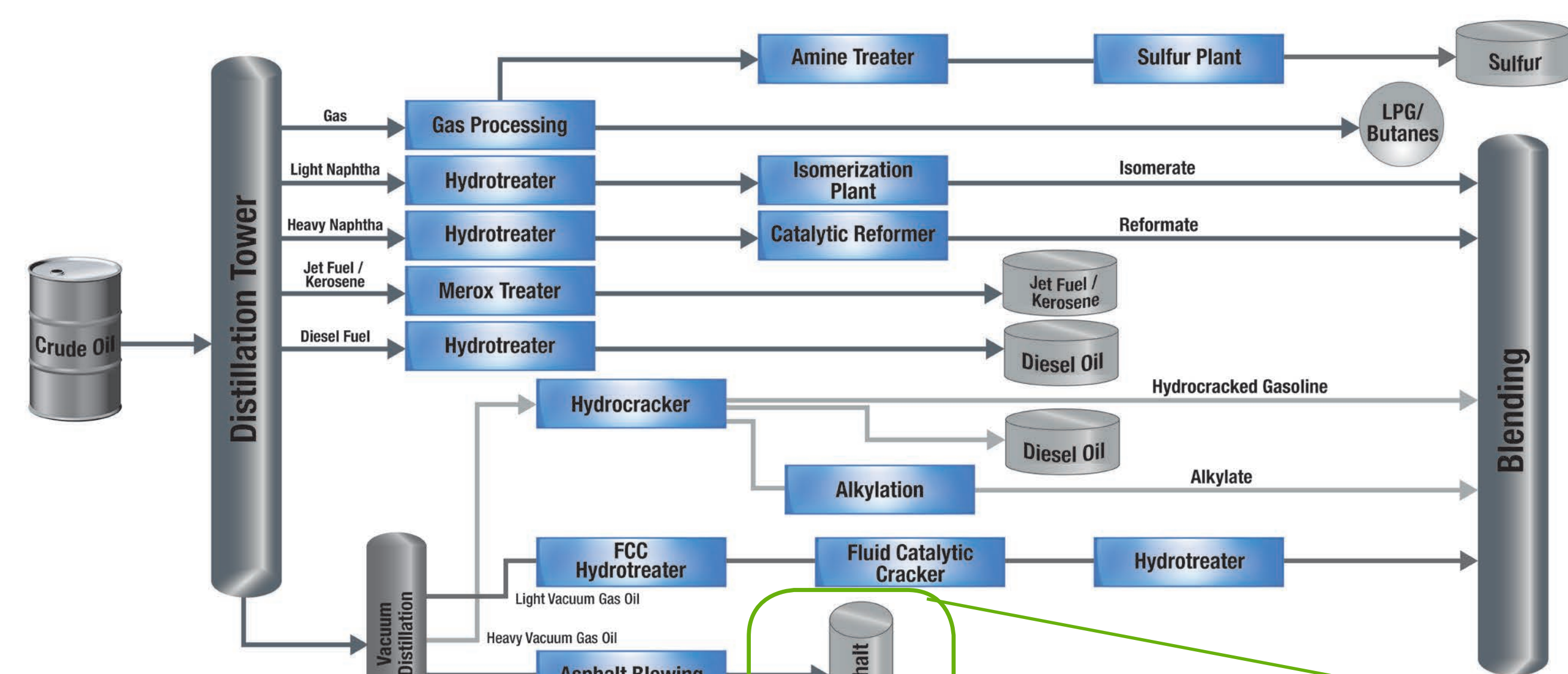


Product Quality Measurement

- Inline viscosity measurement at the product specification temperature
- Tight temperature control without oil bath

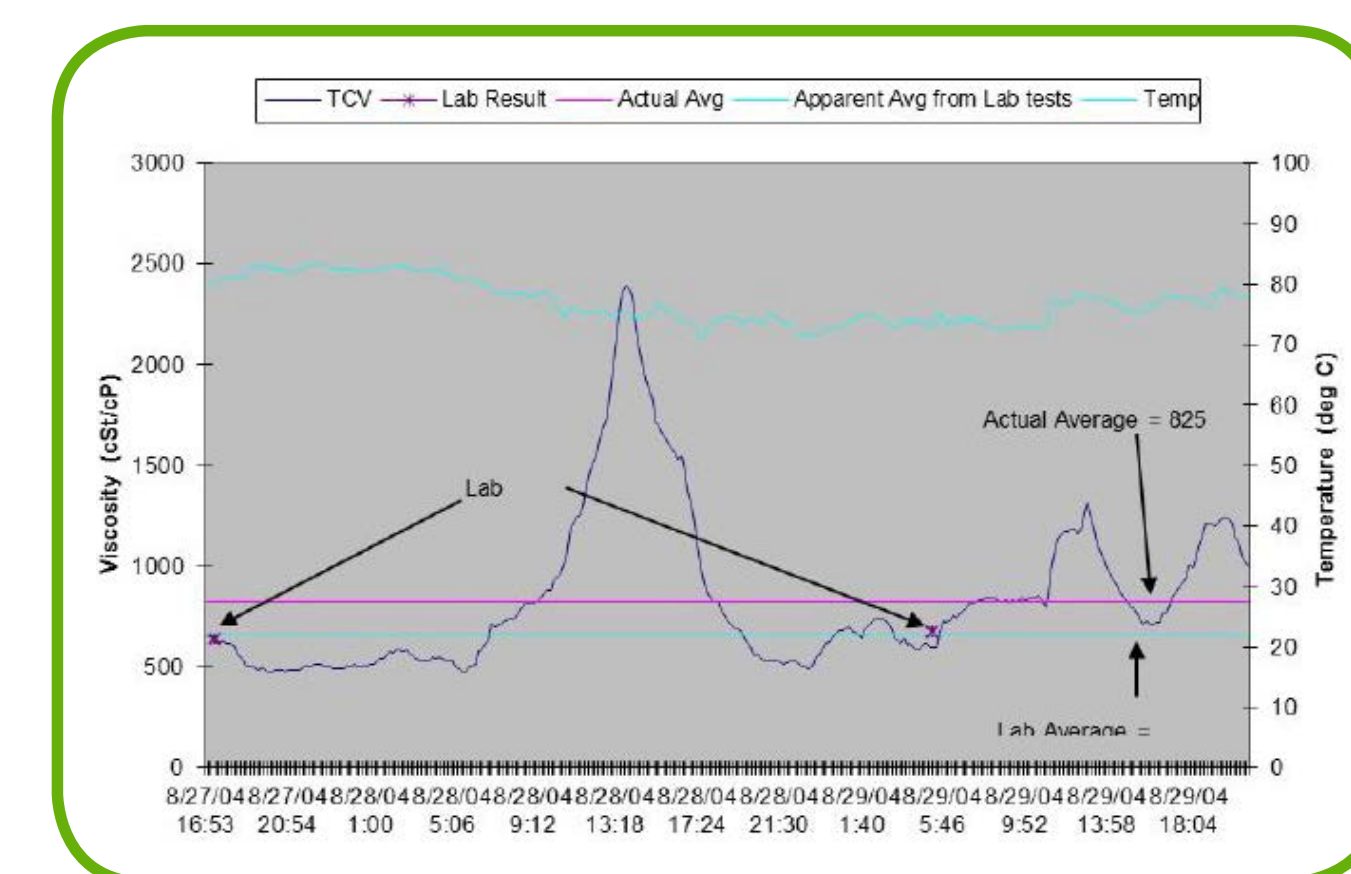
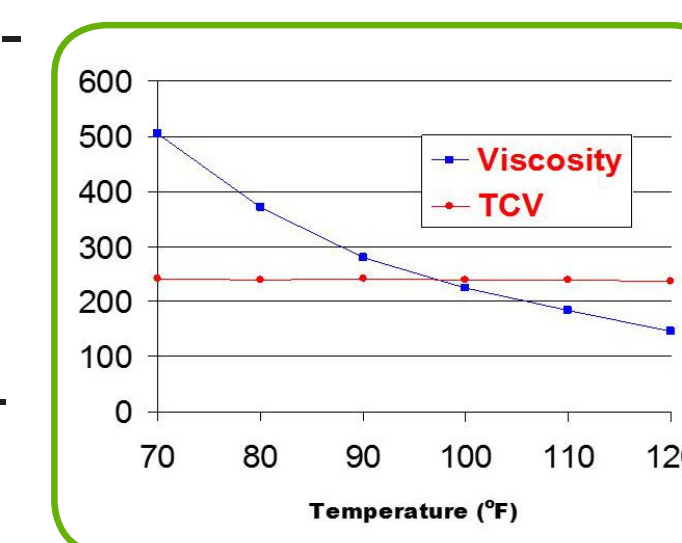


Viscosity Applications



Process Monitoring & Control

- 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



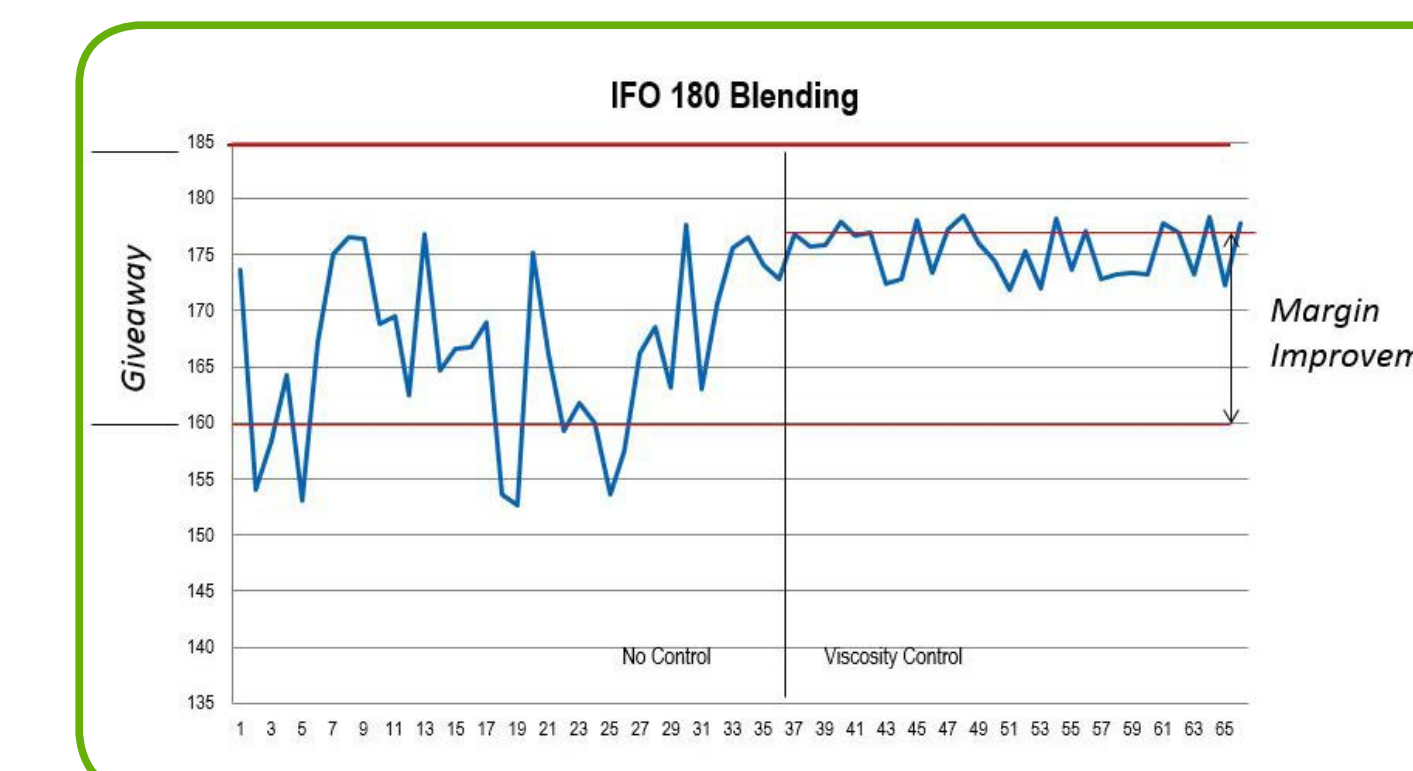
Increased productivity allows you to achieve ROI within two months

CHALLENGE

- Periodic lab sampling methods can miss changes in the process
 - Can lead to off-spec production
 - 12 hours or more can be added to the processing time to return to on-spec production
 - \$150K to \$500K per occurrence

SOLUTION

- ViscoSure or ViscoPro can provide readings every five minutes, instead of an 8- to 12-hour lab sampling method
- Resulting in quick, informed decision making with real-time data and increased productivity and profitability
- Tighter control on viscosity can result in a 0.5% production improvement, or \$50,000 in profit per line each month



Conclusions

- ViscoPro 2100 for process monitoring**
- Viscosity at process temperature
 - Accurate real-time data
 - Easy to install and use
 - Low maintenance/low cost of operation

- ViscoSure for product quality**
- Viscosity at reference temperature
 - Easy to use
 - Superior temperature control
 - Wide range of applications
 - Lubricants
 - Heavy fuel oil
 - Asphalt, vacuum residuals
 - Low maintenance - designed-out high maintenance items