

## Extensive NMR Diesel Database Enhances NMR Model Performance for Unit Control and Product Manufacturing

- An extensive database (10 years) of diesel samples incorporating all refining processes (distillation through product blending) enables development of robust, wide ranging property predictions independent of crude sources and refinery processing. Consistent attention to data integrity enables expanding model ranges well beyond any typical single unit or process operation. The following slides elucidate the consistency in spectra whether obtained 10 years ago or last week, from within a refinery or on a laboratory spectrometer.

**All Diesels: (Data date range 1999 to present)**

**Atmospheric Crude Straight Run**

**Vaccuum Crude Straight Run**

**Coker Diesel**

**FCC Diesel**

**Diesel Hydro Cracker Feed**

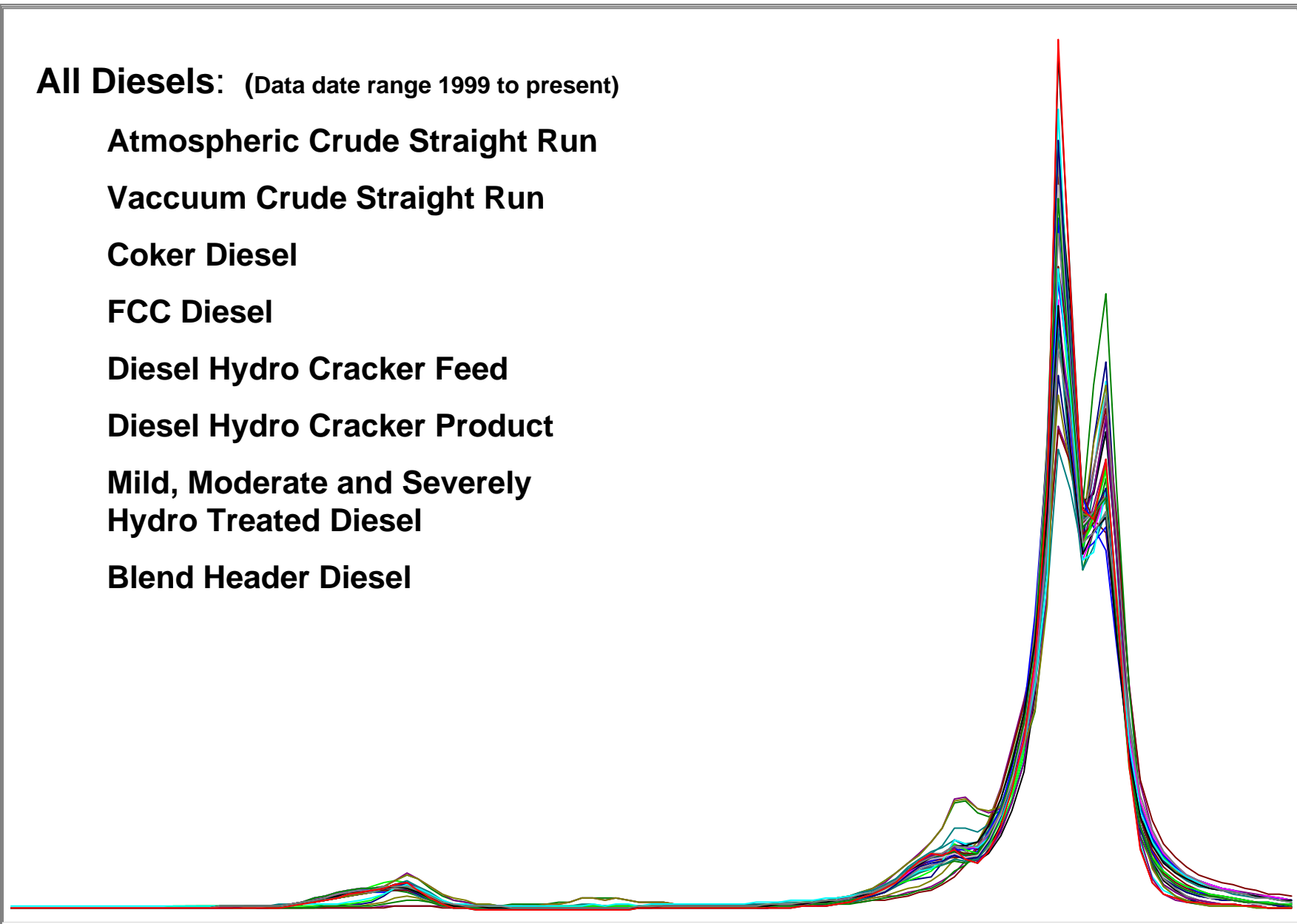
**Diesel Hydro Cracker Product**

**Mild, Moderate and Severely  
Hydro Treated Diesel**

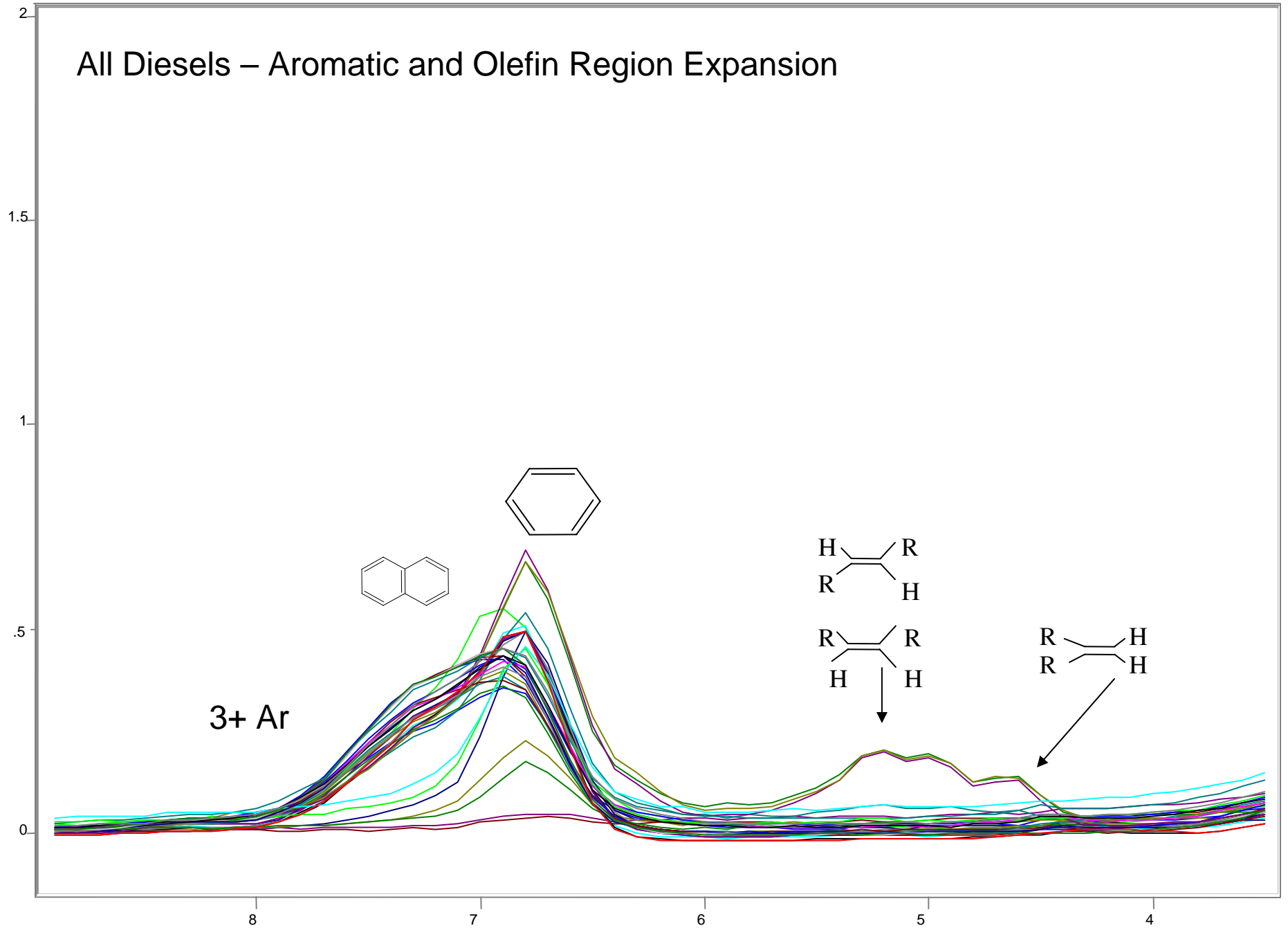
**Blend Header Diesel**

15  
10  
5  
0

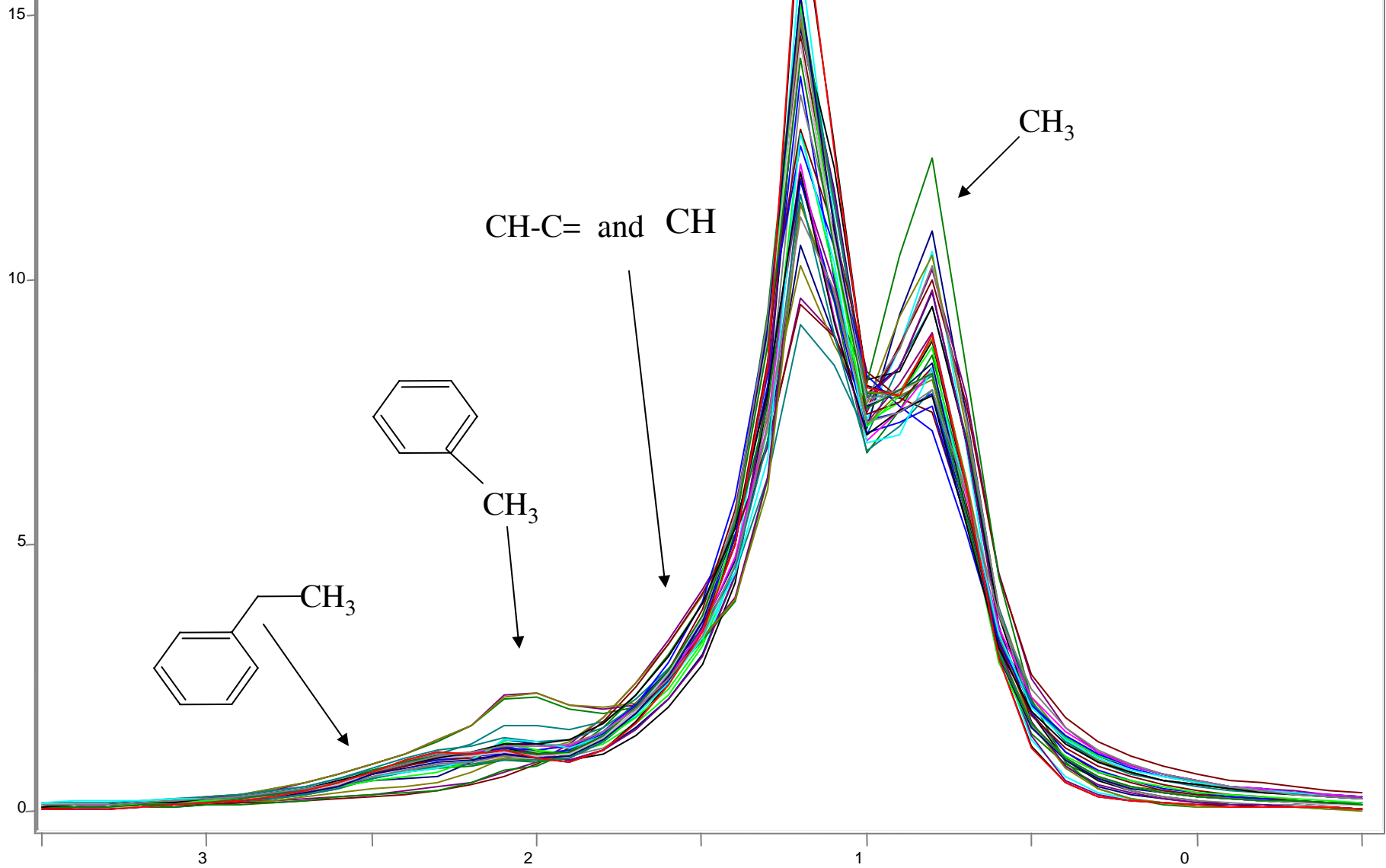
10 8 67 4 2 0



# All Diesels – Aromatic and Olefin Region Expansion



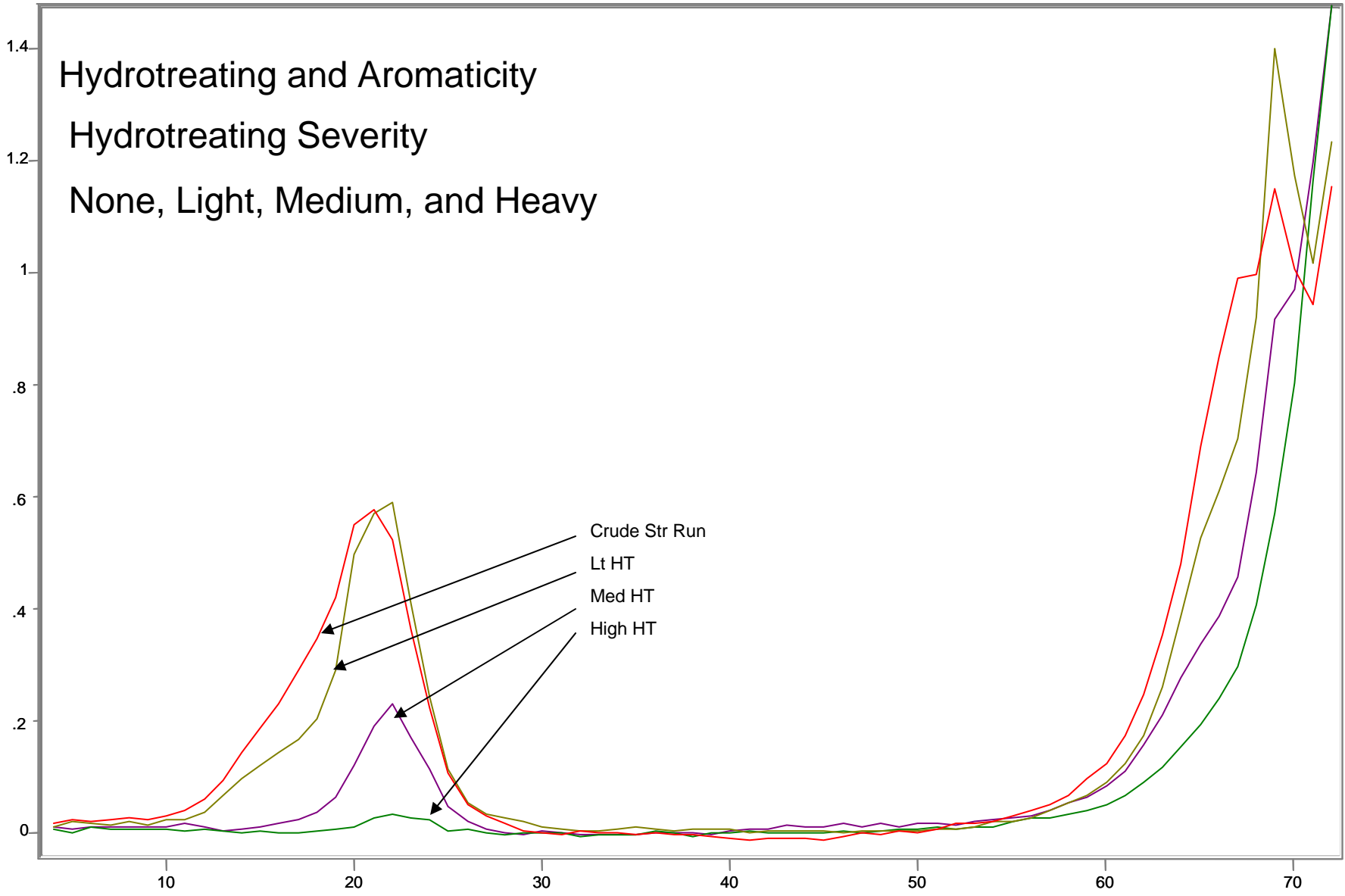
# All Diesels – Aliphatic and Alpha Hydrogen Region Expansion



# Hydrotreating and Aromaticity

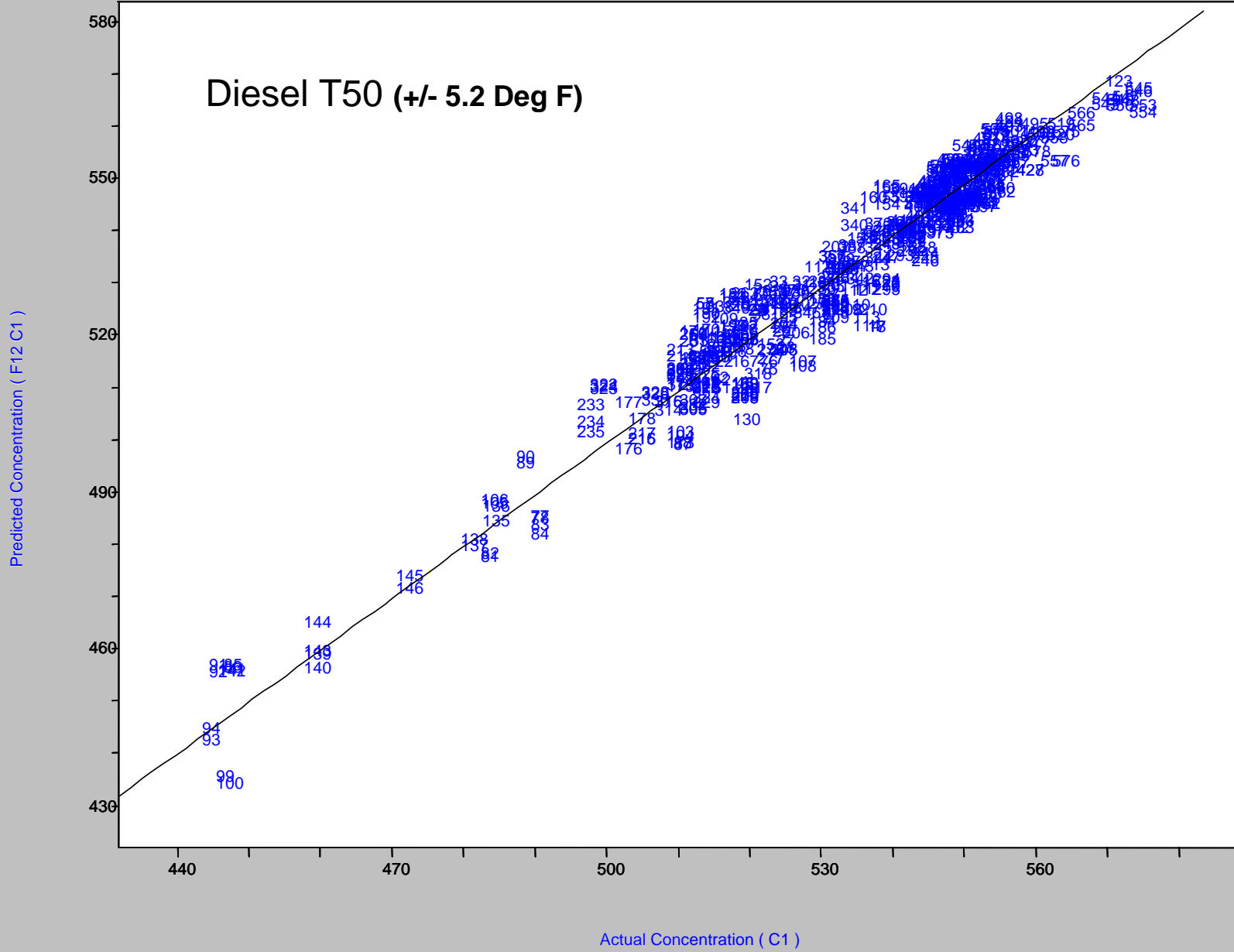
## Hydrotreating Severity

None, Light, Medium, and Heavy



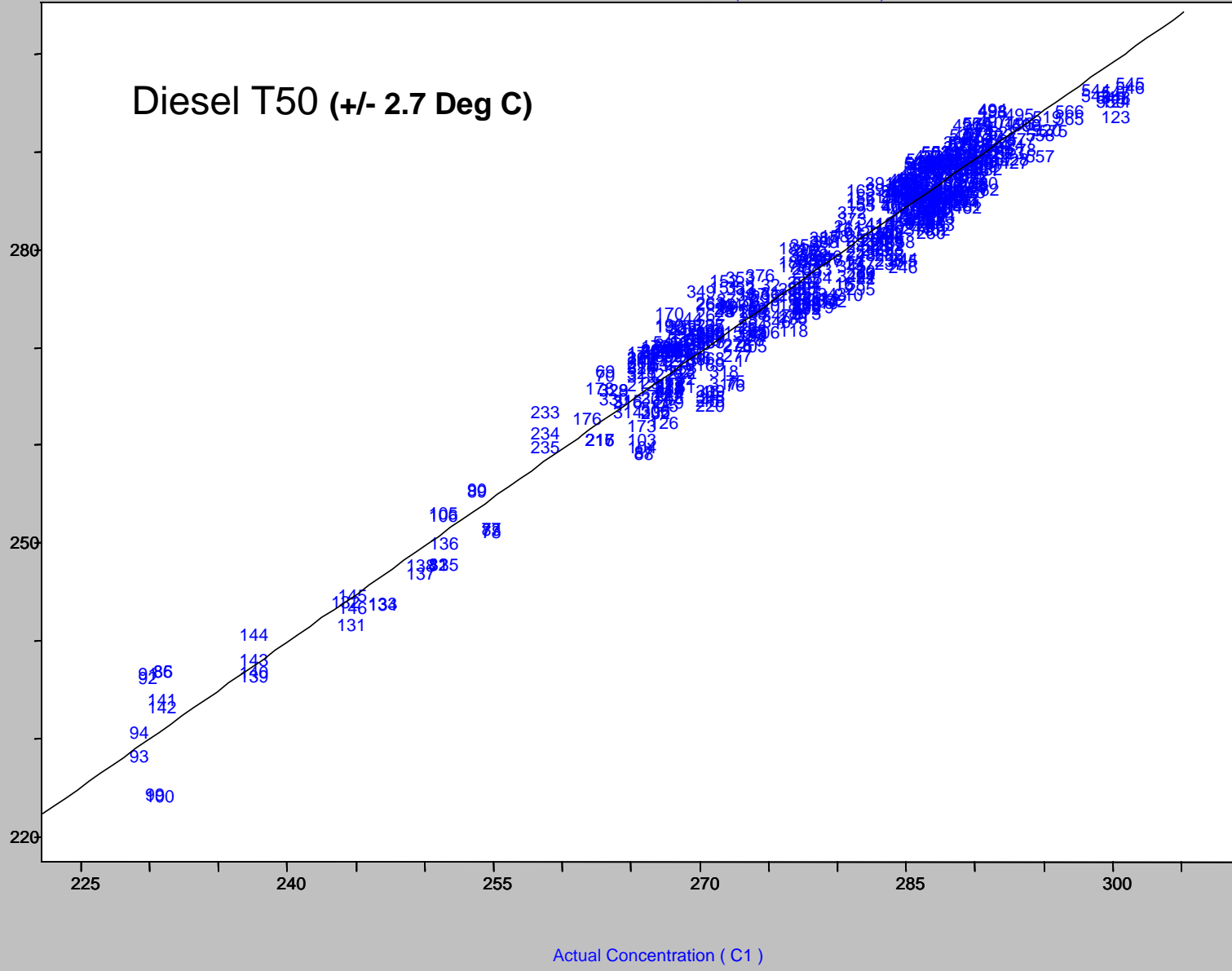
combined diesel t50 deg f 071108.tdf,4 (R<sup>2</sup> = 0.947201716)

# Diesel T50 (+/- 5.2 Deg F)



# Diesel T50 (+/- 2.7 Deg C)

Predicted Concentration ( F11 C1 )



280

250

220

225

240

255

270

285

300

92

141

94

93

90

144

148

139

145

146

133

131

136

137

135

137

106

136

137

135

233

234

235

176

216

173

26

103

108

99

173

33

173

26

170

28

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220

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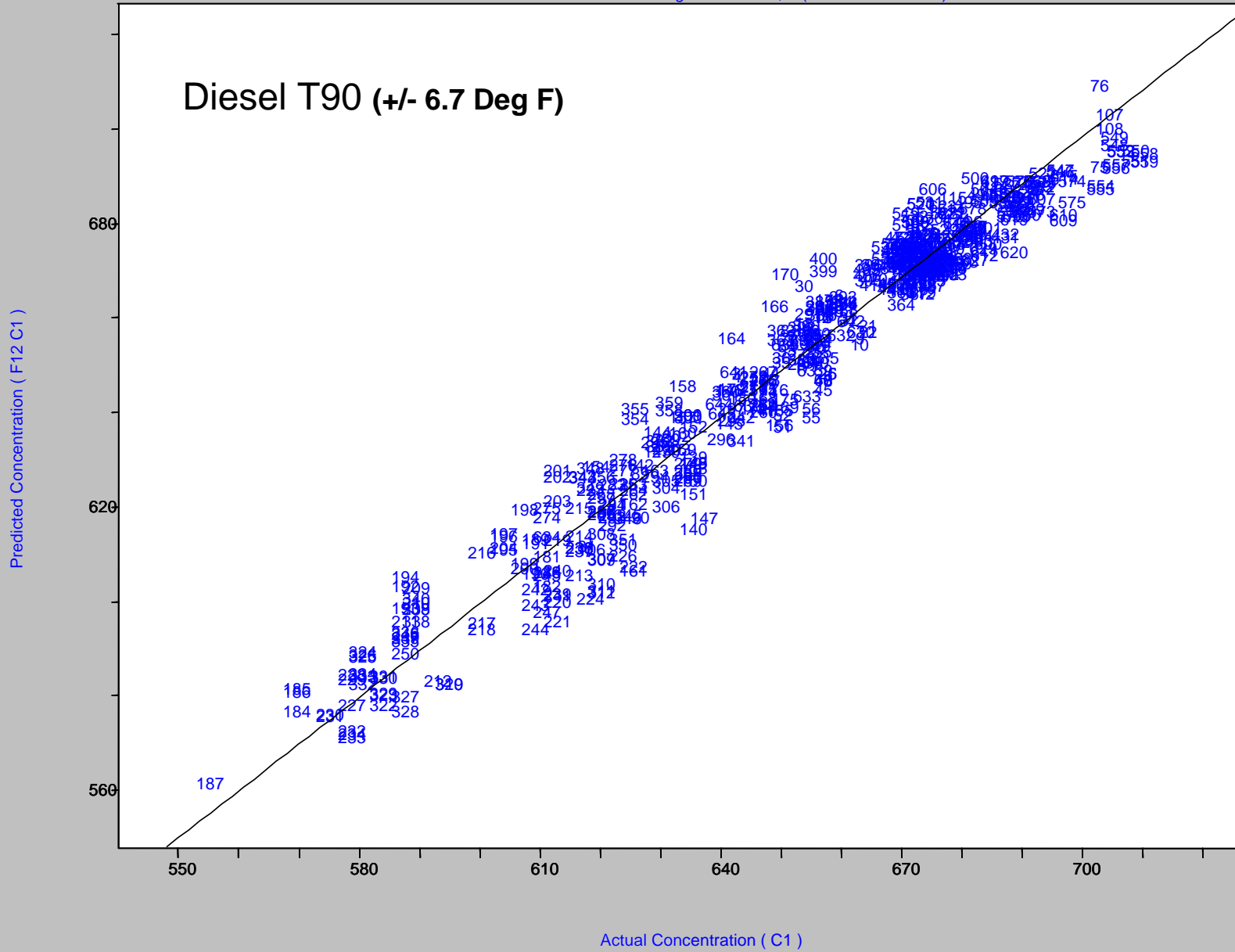
195

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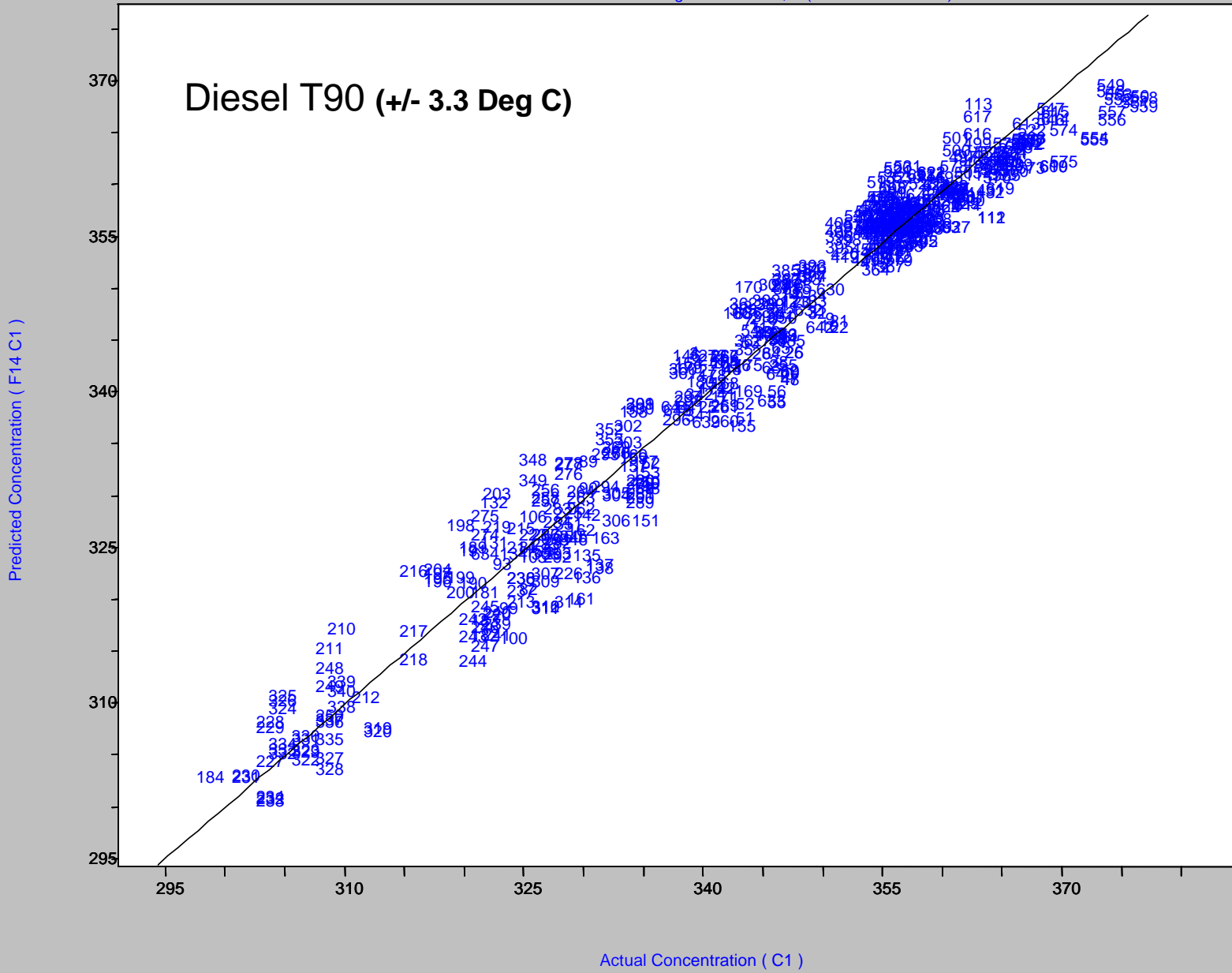
combined diesel t90 deg f 071108.tdf,5 (R<sup>2</sup> = 0.953908613)

# Diesel T90 (+/- 6.7 Deg F)





combined diesel t90 deg c 071108.tdf,6 (R<sup>2</sup> = 0.961256362)



combined diesel flash c 071108.tdf,5 (R<sup>2</sup> = 0.932037993)

# Diesel Flash Point (+/- 2.5 Deg C)

Predicted Concentration ( F11 C1 )

105  
90  
75  
60  
45

40

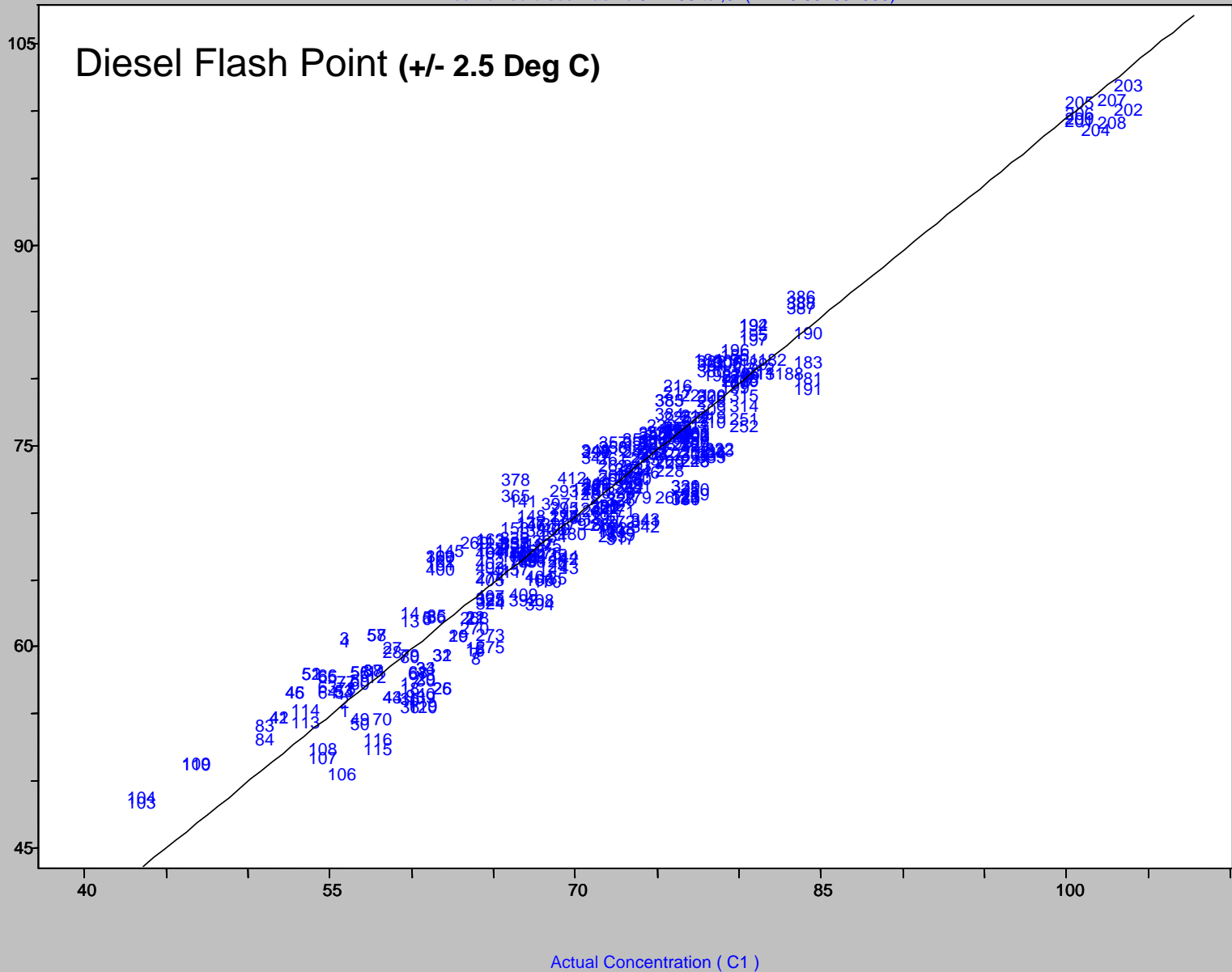
55

70

85

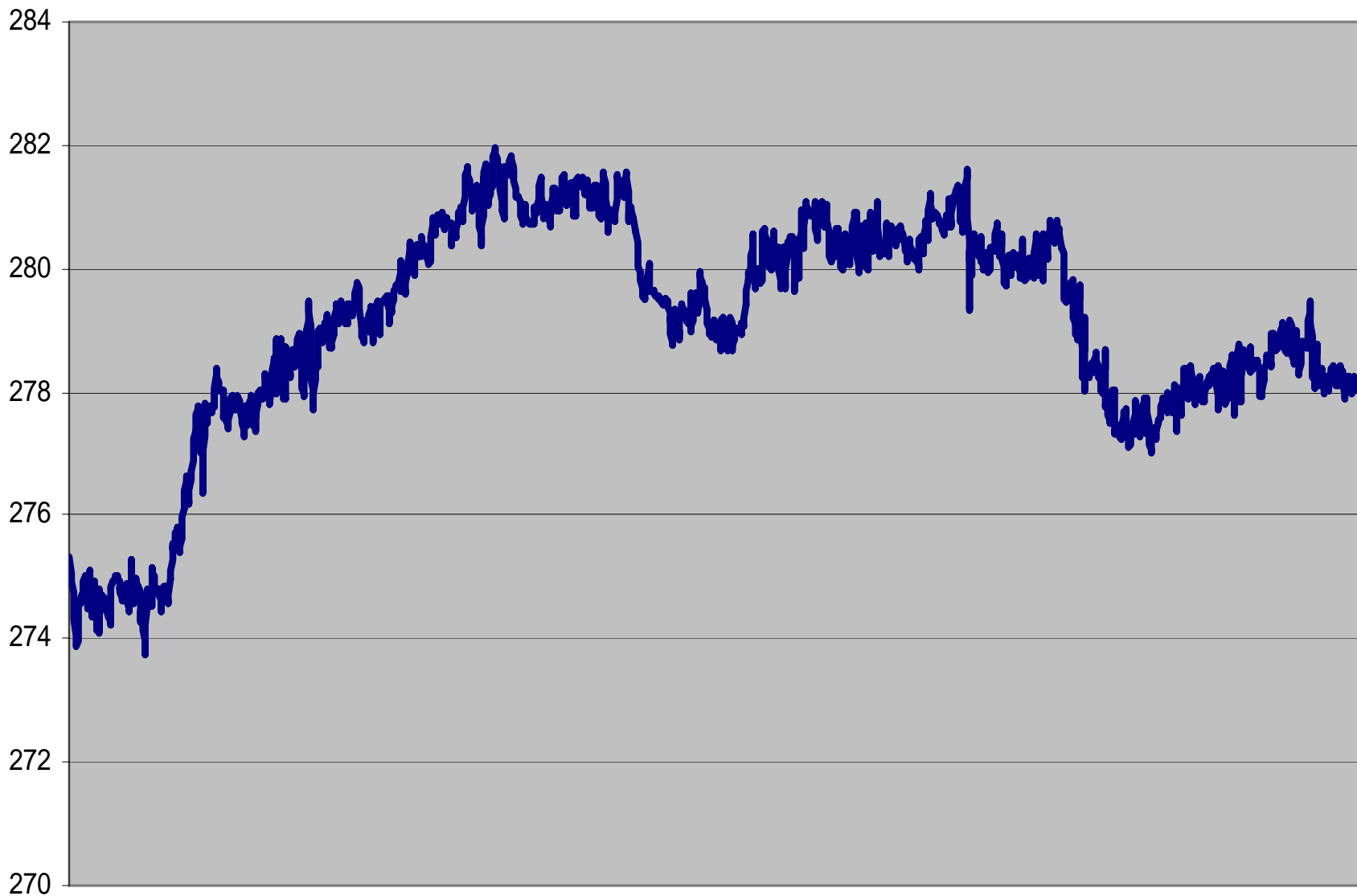
100

Actual Concentration ( C1 )



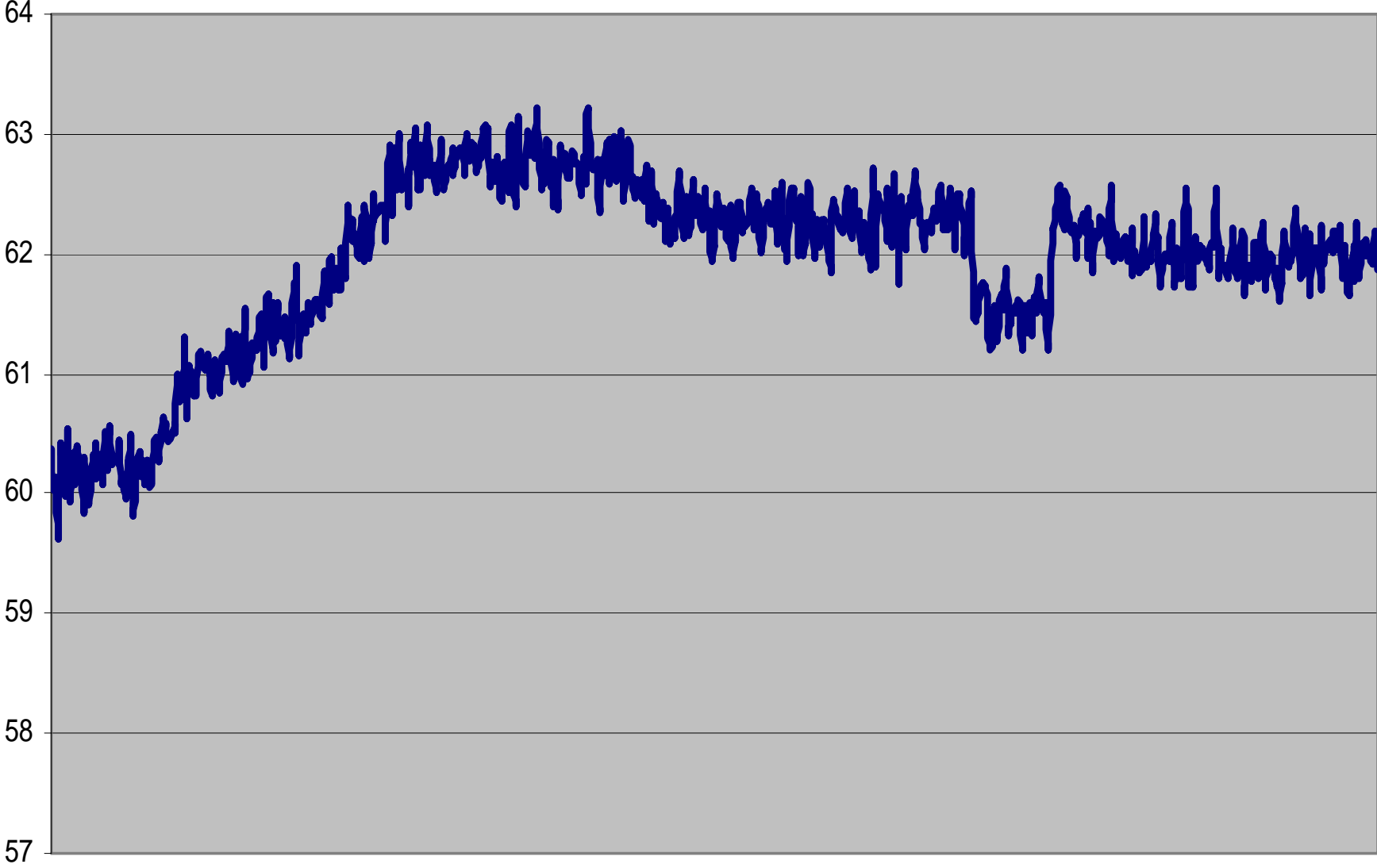


### 3 Week Crude Unit Diesel T50 (C)



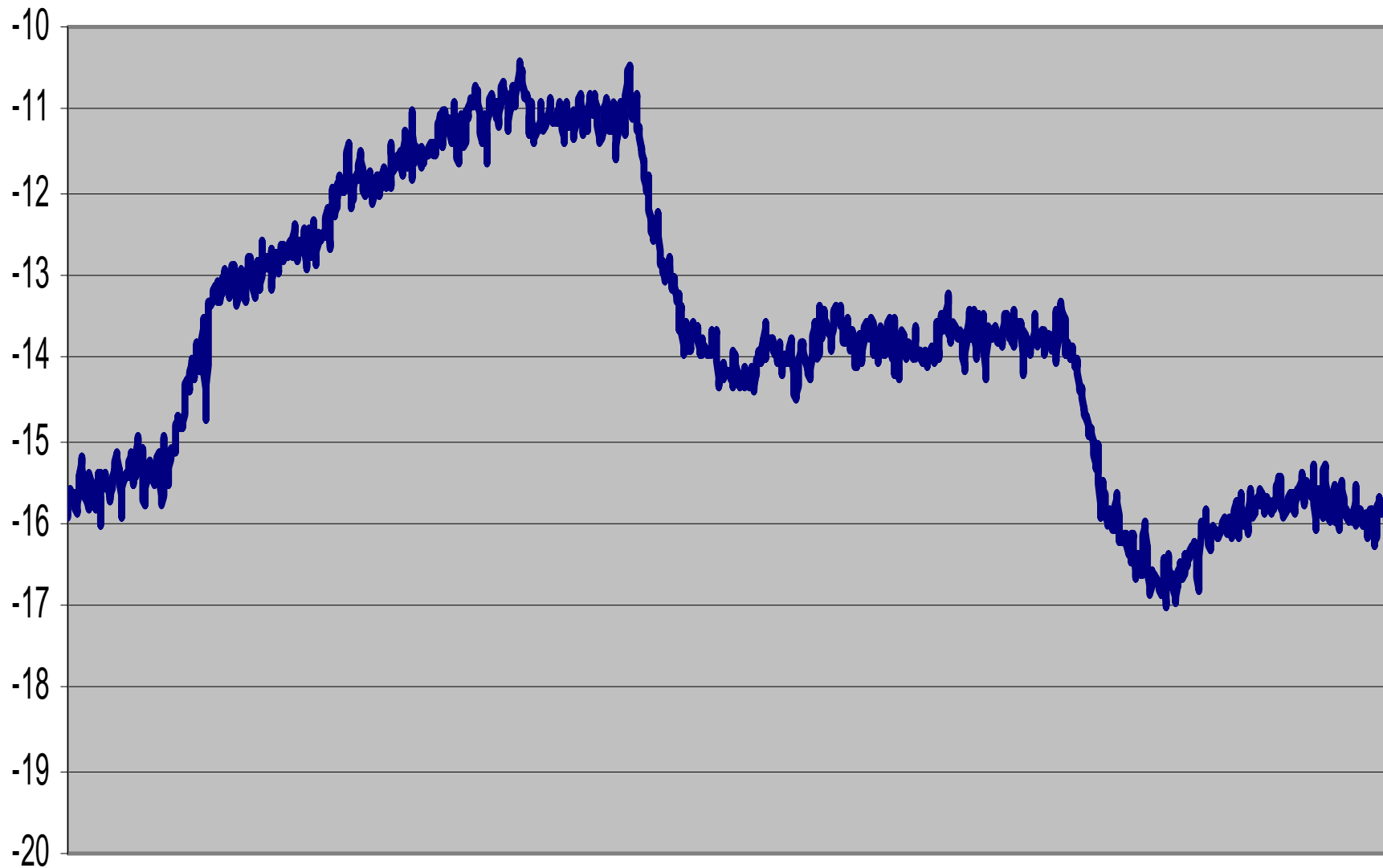
Measurement Interval = 30 minutes

### 3 Week Crude Unit Diesel Flash Point (C)

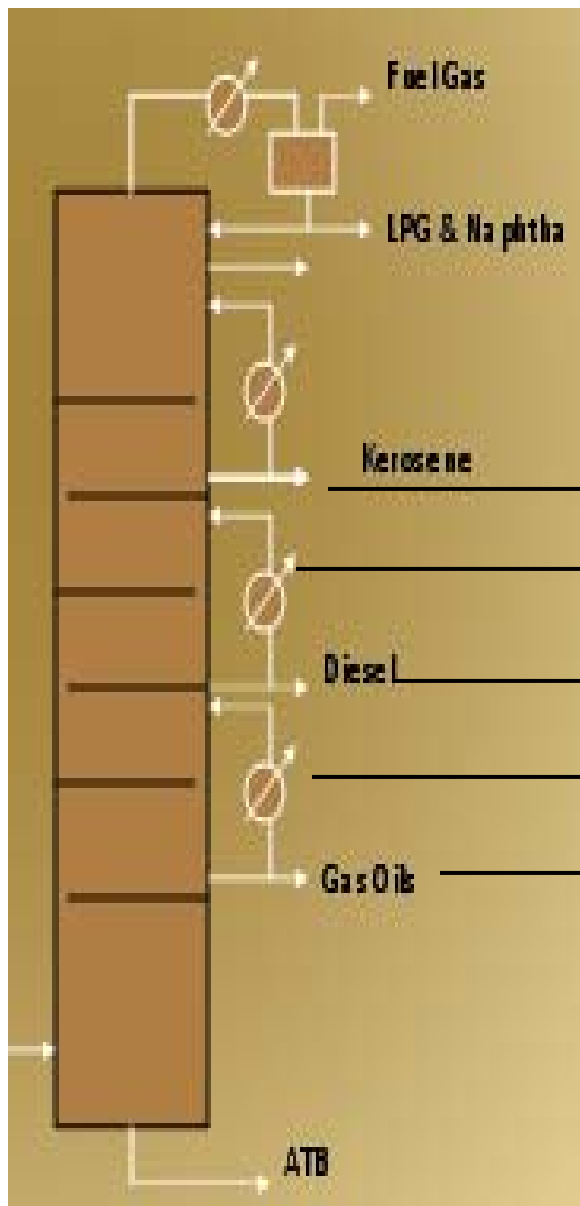


Measurement Interval = 30 minutes

### 3 Week Crude Unit Diesel Cloud Point (C)

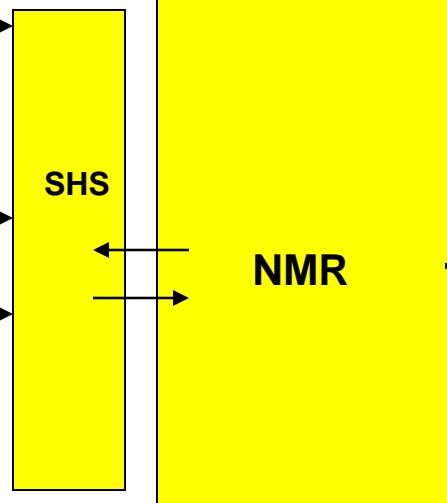


Measurement Interval = 30 minutes



## Integrated Control

Immediate payback through improved diesel and kero yields.



### NMR Parameters

#### Kero

T5, T10, T50, T90, T95

Cetane, Freeze Pt, Naphthalenes

#### Kero PA

T5, T95, Cetane

#### Diesel

T5, T10, T50, T90, T95

Cetane, Cloud Pt, Pour Pt

#### Diesel PA

T5, T95, Cetane

#### Gas Oils

T5, T10, T50, T80 (D2887)

Higher Yields and Improved Hydrotreating

Analyzer Shelter, Sulfur Analyzer