Leading Global Position: ~400 employees & over 30,000 instruments installed
Global Support Network: 11 PAC direct offices & more than 50 distributors
Early Industry Innovator: more than 50 patents
Strong emphasize on R&D: over 50 engineers in six countries
Corporate Structure: part of Roper Industries (NYSE: ROP)
2006 – AC is added to PAC
2000 – Antek is acquired by PAC
1999 – Acquisition of Varlen Instr.; includes Herzog, ISL, PSPI, Alcor, PetroSpec
1981 – Start up of AC Analytical Controls in The Netherlands
1975 – Founding of ISL in France
1967 – Antek started in the USA
1957 – Founding of Alcor in San Antonio, TX
1937 – Walter Herzog GmbH was founded in Germany
EXTENSIVE TECHNOLOGY PORTFOLIO

Elemental Analysis
Fuels Testing
Distillation
Cold Behavior
Lubricants

Viscosity
Jet Fuel Thermal Oxidation Testing
Fuels Combustion Analysis
Gas Chromatography
Process Analyzers
KEY INVESTMENT INITIATIVES

R&D: long term roadmaps & technology development
Product Development: new instruments, applications and software products
Global Support Network: large expansion in India, China & Middle-East
PAC Web Site: improved accessibility and customer interaction
Quality & Reliability: expanded team of quality & reliability engineers
THREE BUSINESS SEGMENTS

LAB INSTRUMENTS
“Full HPI Lab Analytical Instrumentation Provider”
Elemental Analysis
Fuels Composition
Gas Chromatography
Physical Properties
Lab Automation

PROCESS ANALYTICS
“Lab Accuracy On-Line”
Micro Distillation
Physical Properties
Elemental Analysis

AFTER MARKET
“Customer Satisfaction”
eCommerce
PM Contracts
AM Parts Hubs
## GLOBAL TECHNOLOGY CENTERS

### HOUSTON, TX
- **Process On line**
  - RVP
  - Flashpoint
  - Viscosity
  - Pour Point
  - Freeze Point
  - Salt-in-Crude
  - Color
  - Sulfur
  - Nitrogen
- **Fuel Performance**
  - JFTOT
  - VTDR
  - MCRT
  - Composition
  - Color
- **Elemental Analysis**
  - Sulfur
  - Nitrogen
  - Halides

### VERSON, FR
- **Physical Properties**
  - Distillation
  - Flash Point
  - Density
  - Cold Flow
  - Viscosity
  - Bitumen

### LAUDA, GE
- **Physical Properties**
  - Cetane
  - Distillation
  - Flash Point
  - Cold Flow
  - Viscosity
  - Vapor Pressure
  - Bitumen

### ROTTERDAM, NL
- **Gas Chromatography**
  - Reformulyzer
  - SimDis
  - Radian
  - DHA
  - RGA
  - NGA
  - Custom

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USA • FRANCE • GERMANY • THE NETHERLANDS • UAE • RUSSIA • CHINA • SINGAPORE • SOUTH KOREA • THAILAND • INDIA
LEADERSHIP THROUGH INNOVATION

Recent New Product Releases . . .
AC CNS SIMDIS for Crudes

Making Crude Assays Easier:

Fast Crude Oil Characterization for Sulfur, Nitrogen and Carbon
Why CNS SIMDIS – Refinery Tech Drivers

- Moving Regulations (Sulfur)
- Catalyst Poisoning (Sulfur)
- FCC units catalyst deactivation (Nitrogen)
- Salt Formation (Nitrogen) – heat exchanger fouling or filter blockage

Negatively affect
- Product Value
- Up-time
- Profit
- Process Control
CNS provides key data

- Fast Quantitative information on sulfur and nitrogen vs boiling point
- Better understanding on input crude quality
- Allows improved modelling and blending

- Improve production rates (lowering down-times)
- Decrease Cost of Labor
- Improve Refinery Profit
- Optimize value within specification
The Sulfur Simulated Distillation principle as used in the CNS Simdis systems is pioneered by PAC in the ASTM committee:

**ASTM WK24514**

**Determination of Boiling Range Distribution of Hydrocarbons and Sulfur of Petroleum Distillates** by Gas Chromatography and Chemiluminescence Detection
Technology /Hardware - Unique Design

- No sample discrimination
- Programmable inlet
- No sample discrimination.
- Constant split ratio to detectors
- Postcolumn Vent
- Robust
- Reliable Performance

"Cool On Column" Inlet:
- No sample discrimination
- Programmable inlet

CAPILLARY, STAINLESS STEEL:
- Robust
- Reliable Performance

ACTIVE MICROFLUIDIC SPLITTER:
- No sample discrimination.
- Constant split ratio to detectors
- Postcolumn Vent
Technology / Hardware - Overview

Special Nitrogen and Sulfur modules integrated

- AC SIMDIS GC
- Antek 7090NS Detector
- Oil-free (dry) Pump
Software - Reporting

3 Channels Run Simultaneous
from 1 injection

**Hydrocarbon**

**Sulfur**
327 ppm S

**Nitrogen**
199 ppm N
Software – Hydrocarbon Distribution

94.3% recovery

<table>
<thead>
<tr>
<th>BP °C</th>
<th>Recovered mass%</th>
<th>BP °C</th>
<th>Recovered mass%</th>
<th>BP °C</th>
<th>Recovered mass%</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0</td>
<td>42.8</td>
<td>50.0</td>
<td>329.6</td>
<td>80.0</td>
<td>492.6</td>
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<tr>
<td>10.0</td>
<td>96.2</td>
<td>60.0</td>
<td>357.8</td>
<td>85.0</td>
<td>540.2</td>
</tr>
<tr>
<td>15.0</td>
<td>119.6</td>
<td>65.0</td>
<td>390.2</td>
<td>90.0</td>
<td>603.4</td>
</tr>
<tr>
<td>20.0</td>
<td>143.0</td>
<td>70.0</td>
<td>421.8</td>
<td>94.3</td>
<td>706.2</td>
</tr>
</tbody>
</table>

DHA FE: C9 (BP<151°C)
Software – Nitrogen Distribution

<table>
<thead>
<tr>
<th>BP °C</th>
<th>Recovered Fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>190</td>
<td>0.5 %</td>
</tr>
<tr>
<td>210</td>
<td>1.5 %</td>
</tr>
<tr>
<td>230</td>
<td>2.5 %</td>
</tr>
<tr>
<td>250</td>
<td>3.0 %</td>
</tr>
<tr>
<td>280</td>
<td>4.5 %</td>
</tr>
<tr>
<td>300</td>
<td>5.0 %</td>
</tr>
<tr>
<td>310</td>
<td>5.5 %</td>
</tr>
<tr>
<td>320</td>
<td>6.0 %</td>
</tr>
<tr>
<td>330</td>
<td>6.5 %</td>
</tr>
<tr>
<td>340</td>
<td>7.5 %</td>
</tr>
<tr>
<td>350</td>
<td>8.0 %</td>
</tr>
<tr>
<td>360</td>
<td>9.5 %</td>
</tr>
<tr>
<td>370</td>
<td>10.5 %</td>
</tr>
<tr>
<td>380</td>
<td>12.0 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BP °C</th>
<th>Recovered Fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>390</td>
<td>13.5 %</td>
</tr>
<tr>
<td>400</td>
<td>15.0 %</td>
</tr>
<tr>
<td>410</td>
<td>16.5 %</td>
</tr>
<tr>
<td>420</td>
<td>18.5 %</td>
</tr>
<tr>
<td>430</td>
<td>20.5 %</td>
</tr>
<tr>
<td>440</td>
<td>23.0 %</td>
</tr>
<tr>
<td>450</td>
<td>25.5 %</td>
</tr>
<tr>
<td>460</td>
<td>28.0 %</td>
</tr>
<tr>
<td>470</td>
<td>31.0 %</td>
</tr>
<tr>
<td>480</td>
<td>34.0 %</td>
</tr>
<tr>
<td>490</td>
<td>37.0 %</td>
</tr>
<tr>
<td>500</td>
<td>40.0 %</td>
</tr>
<tr>
<td>510</td>
<td>43.5 %</td>
</tr>
<tr>
<td>520</td>
<td>47.0 %</td>
</tr>
<tr>
<td>530</td>
<td>50.5 %</td>
</tr>
<tr>
<td>540</td>
<td>54.0 %</td>
</tr>
<tr>
<td>550</td>
<td>57.5 %</td>
</tr>
<tr>
<td>560</td>
<td>61.5 %</td>
</tr>
<tr>
<td>570</td>
<td>65.0 %</td>
</tr>
<tr>
<td>580</td>
<td>68.5 %</td>
</tr>
<tr>
<td>590</td>
<td>72.5 %</td>
</tr>
<tr>
<td>600</td>
<td>76.0 %</td>
</tr>
<tr>
<td>610</td>
<td>79.5 %</td>
</tr>
<tr>
<td>620</td>
<td>83.0 %</td>
</tr>
<tr>
<td>630</td>
<td>86.5 %</td>
</tr>
<tr>
<td>640</td>
<td>90.0 %</td>
</tr>
<tr>
<td>650</td>
<td>92.5 %</td>
</tr>
<tr>
<td>660</td>
<td>95.5 %</td>
</tr>
<tr>
<td>670</td>
<td>98.0 %</td>
</tr>
<tr>
<td>680</td>
<td>100.0 %</td>
</tr>
</tbody>
</table>
Software – Sulfur Distribution

BP °C | Recovered | Fraction
---|-----------|-----------
240 | 0.5       | 0.5       
270 | 1.5       | 1.0       
290 | 2.5       | 1.0       
300 | 3.0       | 0.5       
310 | 4.0       | 1.0       
320 | 5.5       | 1.5       
330 | 7.0       | 1.5       
340 | 9.5       | 2.5       
350 | 11.5      | 2.0       
360 | 14.0      | 2.5       
370 | 16.0      | 2.0       
380 | 18.5      | 2.5       
390 | 20.5      | 2.0       
400 | 23.5      | 3.0       
410 | 26.0      | 2.5       

BP °C | Recovered | Fraction
---|-----------|-----------
420 | 28.5      | 2.5       
430 | 31.5      | 3.0       
440 | 34.0      | 2.5       
450 | 37.0      | 3.0       
460 | 39.5      | 2.5       
470 | 42.5      | 3.0       
480 | 45.5      | 3.0       
490 | 48.5      | 3.0       
500 | 51.5      | 3.0       
510 | 54.5      | 3.0       
520 | 57.5      | 3.0       
530 | 60.5      | 3.0       
540 | 63.0      | 2.5       
550 | 66.0      | 3.0       
560 | 69.0      | 3.0       
570 | 71.5      | 2.5       
580 | 74.5      | 3.0       
590 | 77.0      | 2.5       
600 | 79.5      | 2.5       
610 | 82.0      | 2.5       
620 | 84.5      | 2.5       
630 | 87.0      | 2.5       
640 | 89.0      | 2.0       
650 | 91.0      | 2.0       
660 | 93.0      | 2.0       
670 | 96.0      | 2.0       
680 | 96.5      | 1.5       
690 | 98.0      | 1.5       
700 | 99.5      | 1.5       
710 | 100.0     | 0.5       

mass %
Provides valuable product information:

- Results compare to (accelerated) ASTM D 2887, D6352, D7500, D7169
- Boiling point distribution Hydrocarbons, Sulfur and Nitrogen
- % volume for TBP curve
- Total Conc. Sulfur & Nitrogen
- Customizable cut-point reporting
A set of calibration and reference samples optimizes system performance:

**Calibration Samples**
- Boiling point calibration
- Sulfur and Nitrogen response calibration
- A True Crude Oil Calibration (BP 200-550°C)

**Reference Samples (Validation)**
- Hydrocarbon boiling point
- Sulfur concentration and distribution
- Nitrogen concentration and distribution

- Pre-configured per sample type
- Equimolarity Validation
- Sensitivity Validation
- Stability Validation
Reliable Solution
- Robust design using proven technologies
- User-friendly SIMDIS software
- Known methods, dedicated correlations and calculations

Easy to Use Solution
- Complete solution
- Complete range of Calibration, Reference and QC (validation) samples
- Application is delivered factory-tuned to Method
- On-site installation and familiarization within 3 days
- Free helpdesk assistance
- Optional on-line remote support by LAN connection
CNS SIMDIS Summary

- Simultaneous Analysis of C, N & S
- Robust Design
- Dedicated, specific Software & Reports
- Known methods
- Calibration & Reference Materials included
- Integrated & automated solution
- Tested, Calibrated, Tuned
- Commissioning / Training on-site

Efficiency
- Reliable, 24/7
- Actionable Information
- Acceptability
- Complete Solution
- Ease of use, 24/7
- Fast install, turnkey
- No ‘Experts’ Needed

- Make Crude Assays Easier & Faster,
- Optimize Crude Input Blending and Final Product quality
- Increase Refinery Profit

USA • FRANCE • GERMANY • THE NETHERLANDS • UAE • RUSSIA • CHINA • SINGAPORE • SOUTH KOREA • THAILAND • INDIA
• PAC works in close cooperation with ISO, ASTM, CEN, UOP, GPA, EN, DIN, IP, GOST, etc.

• PAC’s knowledge sharing advances quality standard through industry expertise and technology innovation

<table>
<thead>
<tr>
<th>Distillation</th>
<th>ASTM D 86, D850, D1078, D1160</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elemental Analyzers</td>
<td>D5453, 6667, 4629, 5176, 5762, 6069, 6751, DIN38409, EN20846 UOP975</td>
</tr>
<tr>
<td>Cold Behavior</td>
<td>D97, D2500, D6892, IP 219, IP 15, D637, IP309, Def Std 91-91, IP529, IP468, D2386, D7136, IP16, ISO3013</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>D5191, D6378, EN13016, IP394, IP481, D1267, D323, D4953, DIN51754</td>
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<tr>
<td>Chromatography</td>
<td>ISO 6974, D1945, D6228, GPA2261, 2286, 2186, UOP 539, D2163, DIN 51666, D6228, UOP 539, D2163</td>
</tr>
</tbody>
</table>
GLOBAL REACH . . . LOCAL CONNECTION

NEW PAC WEB SITE

LIVE CHAT MODULE

NEW PAC NEWSLETTERS