



# Compositional Analysis

Processed Food Industry



Moisture/Solids

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Fat

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Protein

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## Safe and Easy Food Analysis

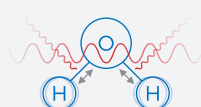


# Extremely Accurate and Repeatable Results

Processed Food encompasses a wide variety of products. Analysis can be complex, and the products can contain a wide variety of changing ingredients. Our systems are uniquely positioned to provide the most accurate and repeatable results, regardless of product reformulations or ingredient changes.

Compared to reference techniques, our technology is much easier and safer to use. Compared to other rapid techniques, our technology is more accurate and robust, while maintaining very rapid test times. For these reasons, thousands of CEM instruments are used around the world.

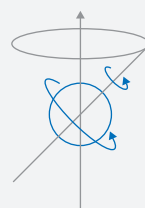
## Key Technologies



### Dual-Frequency Drying (SMART 6)

- Microwave and infrared energy sources controlled by an intelligent processing system
- Works on any type of sample (liquid, powder, slurry)
- Eliminates sample burning issues
- Recognized as an AOAC approved method

[Learn More: Page 6](#)



### NMR (ORACLE)

- Rapid and direct fat analysis
- No method calibrations
- Superior to NIR/FT-NIR
- More repeatable than wet chemistry reference methods

[Learn More: Page 13](#)

## Processed Foods Industry

## Sample Types

Alfredo Sauce  
Almond Milk  
Bar Layers  
Batter  
Bean Flakes  
Beef Bouillon Powder  
Beef Tallow  
Beer  
Beer Syrup  
Bologna  
Butter  
Butter Beans  
Caramel, Soft  
Cheese Loaf  
Cheese Sauce  
Cheese Slices  
Cheese Slices, Imitation  
Cheese Sticks  
Chicken, Breaded  
Chicken Paste  
Chickpeas  
Chili  
Chocolate  
Chocolate Pudding  
Chocolate Whey Powder  
Cinnamon Powder  
CMP Slurry  
Coffee Creamer  
Coffee Extract  
Coleslaw  
Cookies  
Corn Feed  
Corn Mash  
Corn Slurry  
Corn Syrup  
Corn, Raw  
Cornbread

Cottage Cheese  
Cottage Cheese  
Cranberries  
Cream Cheese  
Creamer Mix  
Creamer, Non-dairy  
Croûtons  
Custard  
DDGS, Corn  
DDGS, Rice  
Dietary Foods and Supplements  
Donuts  
Dough  
Dressing  
Dry Potatoes  
Egg Whites  
Eggnog  
Eggs  
Emulsifier, Powdered  
Farmers Cheese  
Fish Meal, Cod and Pollock  
Fish, Breaded  
Flavored Yogurt  
Flour  
Fondant  
Frappuccino®  
French Onion Dip  
French Toast  
Fructose  
Fruit Peel  
Glaze  
Graham Cracker  
Greek Yogurt  
Guacamole  
Honey

Infant Formula  
Jerky  
Ketchup  
Lactose Powder  
Lactose Liquid  
Lard  
Licorice  
Macaroni and Cheese  
Maltodextrin  
Margarine  
Mayonnaise  
Mink Feed  
Mousse  
Mushroom Sauce  
Nutrition Bar  
Nutrition Drink  
Onion Rings  
Orange, Solids and Peel  
Parmesan Cheese  
Peanut Butter  
Pectin  
Pepper  
Pet Food, Dry  
Pie Dough  
Pie Filling  
Pizza Dough  
Pork Broth  
Potassium Carbonate  
Potato Chips  
Potatoes, Dehydrated  
Potatoes, Frozen  
Potted Meat  
Poultry Meal  
Pretzel  
Pudding  
Pumpkin  
Ravioli

Raw Meat  
Raw Meats, Calculated Protein  
Refried Beans  
Rice  
Rice Flour  
Ricotta Cheese  
Roux  
Salad Dressing  
Sorbet  
Sour Cream  
Soy Curd  
Soy Milk  
Soy, Flour  
Soy Products  
Soybean Oil  
Soybeans  
Starch  
Sunflower Seeds  
Sweet Whey Powder  
Sweetened Condensed Milk  
Tofu  
Tomatoes  
Tomato Paste  
Tortilla Chips  
Turkey, Mechanically Separated  
Vegetable Powder  
Whey  
Whey Cream  
Whey Powder  
Whey, Crystallized  
WPC Powder  
WPC/WPI  
Yogurt  
Yogurt with Fruit  
Yogurt, Flavored

“We use the CEM SMART and NMR technology to test moisture and fat on our mayonnaise and salad dressings. These systems have allowed us to accurately control the oil in our products which has saved us money. We would highly recommend CEM’s technology for moisture and fat analysis.”

Kathy Crean / QA Supervisor

**Ventura Foods LLC**

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“CEM’s SMART 6 and ORACLE have given us the flexibility and the accuracy we have been looking for in a rapid test. Comparative studies show CEM’s SMART and NMR technology are both accurate and precise for moisture and fat determination. We would highly recommend CEM’s technology for providing reliable and quick results we can trust.” (FITCO manufactures high quality poultry-based ingredients)

Dannielle Price / Lab Manager

**FITCO: Food Ingredients Technology Co.**

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“We prefer CEM’s SMART and NMR for fast, accurate and easy to use solids and fat testing. CEM’s technology consistently provides accurate results and we would highly recommend its use for food testing.” (KanPak tests soft serve ice cream, nutritional drinks, iced cappuccinos)

Zach Lancaster / QA Lab Manager

**KanPak LLC**

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“The CEM SMART/NMR moisture/solids and fat testing system is a wonderful instrument. It allows us to analyze our products accurately, quickly and consistently even with the variety of products we test. Using no chemicals is a benefit, maintenance of the equipment is very low, and CEM provides excellent support. We would highly recommend this instrument for fat and moisture analysis. (Mullins Food Group manufactures high quality sauces, ketchup, dressings, and spreads)

Charlie Wind / Harold Gause

Quality Assurance Director/Lab Manager

**Mullins Food Products Quality Systems**

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“CEM’s SMART 6 and NMR technology are accurate, fast, reliable, and easy to use. CEM provides top notch customer service and installation. I would recommend this product to anyone needing moisture, solids, and fat capabilities.” (C.F. Sauer Company is a top producer of spices, flavoring extracts, and other food products)

Skyler Walling / Asst. Quality Manager

**C.F. Sauer Company**





**SMART 6** Microwave + Infrared  
Moisture & Solids Analyzer





The gold standard in moisture/solids analysis.

## Overview

The SMART 6 is the most technologically advanced system in the world for rapid moisture/solids analysis. The system is based on the revolutionary new breakthrough called iPower for sample drying. This patented dual-frequency energy source provides the most rapid and complete drying available, for the widest range of sample types.

## Features

- Up to 40% faster than CEM's SMART 5 Turbo
- Analyze both dry and wet products on one system
- Preprogrammed methods for all sample types
- Compact and lightweight for easy at-line placement

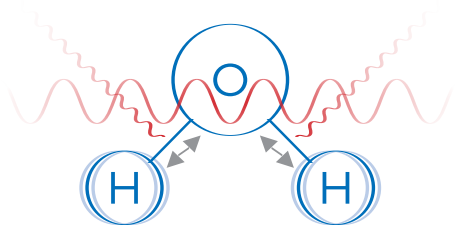
## Validation

- 985.14 (AOAC)
- AOAC 2008.06
- AOAC PVM 1.2004



Over 11,000 moisture analyzers sold worldwide

## Dual-Frequency Drying



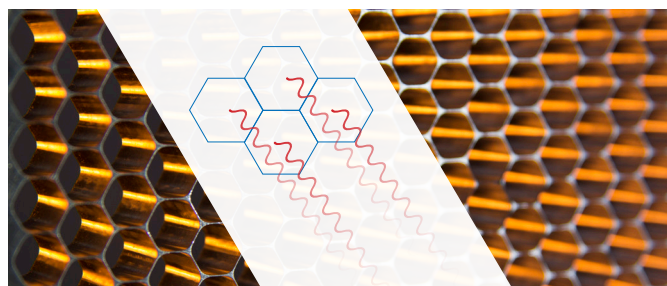
Analyze wet and dry samples with unmatched speed.

An innovative heating process based on the use of a dual-frequency energy source controlled by an intelligent processing system. This prevents burning or incomplete drying, which can arise from other drying technologies.

The result is a direct method for virtually any type of sample, with faster drying than traditional microwave or infrared based systems.

- Analyze wet and dry samples with unmatched speed
- Eliminates surface burning
- Little to no “cool down” time between tests

## Collimated Energy

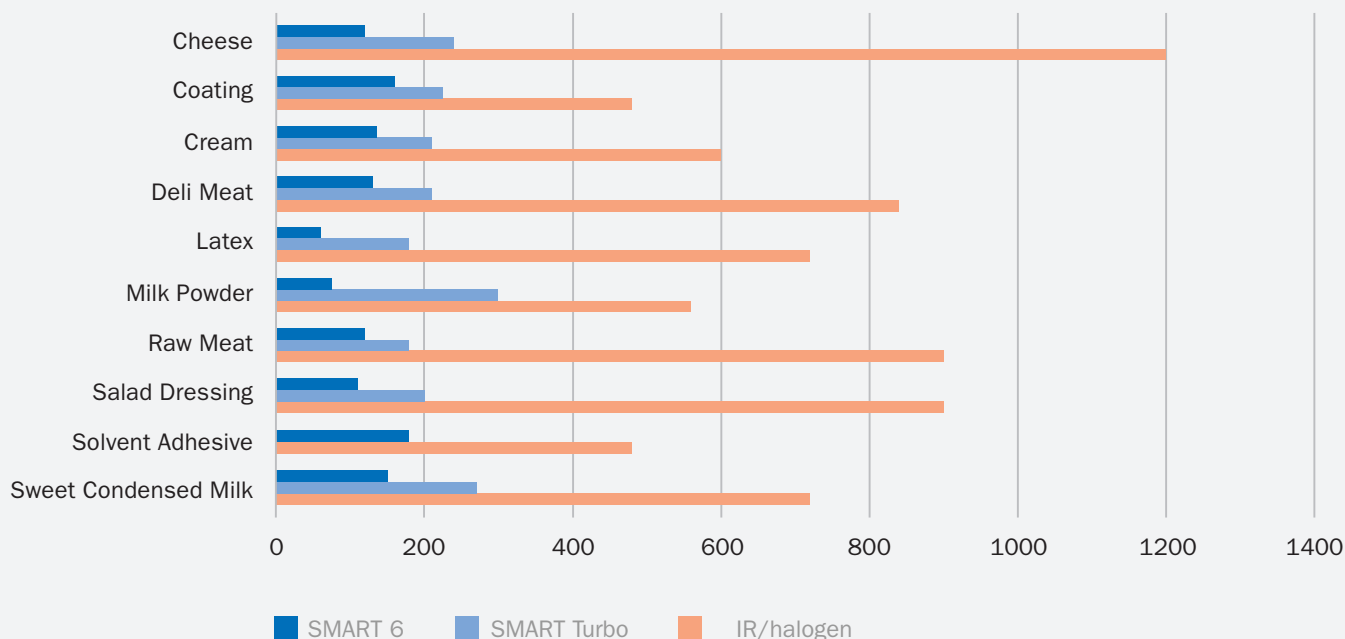


Accurate and repeatable results come standard.

Stray infrared irradiation can negatively impact sample temperature readings with the use of infrared temperature sensors. SMART 6 has a unique honeycomb lattice, providing collimated infrared irradiation for sample heating, thereby avoiding stray light. This provides highly accurate temperature control.

- Extremely uniform drying
- Unmatched reproducibility

## Time Comparison





## System Comparison



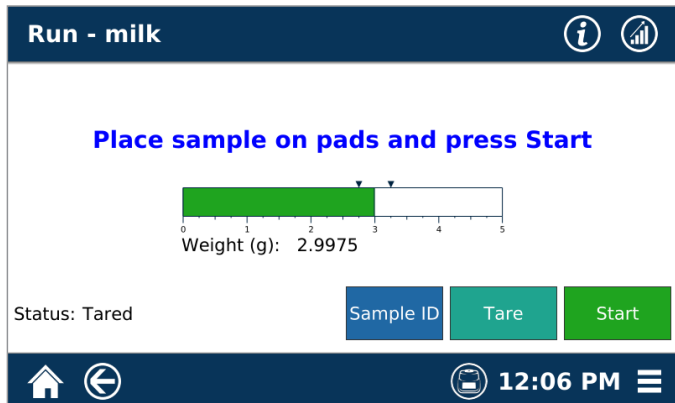
**SMART 6™**



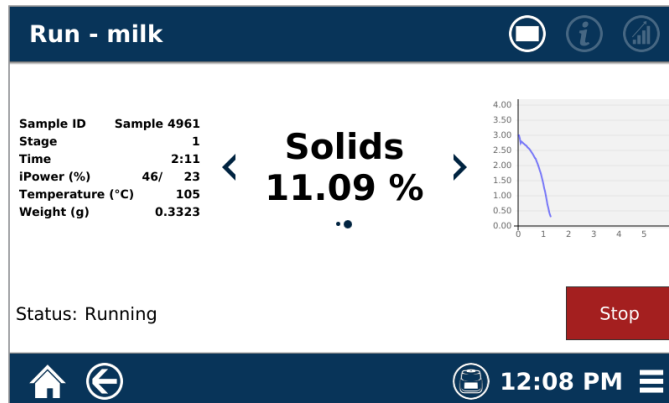
**SMART Turbo™**

<b>Removal Species</b>	Free + Bound Moisture Polar + Non-Polar	Free Moisture Polar Volatiles
<b>Moisture/Solids Range</b>	0.01 to 99.9%, 0.01% resolution (optional 0.001%)	0.01 to 99.9%, 0.01% resolution (optional 0.001%)
<b>Drying Energy</b>	Dual-frequency Electromagnetic Irradiation (iPower)	Microwave Energy
<b>Temperature Control</b>	Infrared	Infrared
<b>Balance</b>	<ul style="list-style-type: none"> <li>• 23 grams capacity</li> <li>• 0.1mg readability</li> </ul>	<ul style="list-style-type: none"> <li>• 23 grams capacity</li> <li>• 0.1mg readability</li> </ul>
<b>Thermal Nulling (Buoyancy Compensation)</b>	Enhanced with iPower	Standard
<b>Display</b>	7-inch capacitive LCD touchscreen (800 x 600)	Black and White VGA (320x240)
<b>Program/Data Storage</b>	Unlimited	100 methods, 300 results
<b>Data Analysis</b>	Advanced	Standard
<b>System Wake-up</b>	Proximity Detection	Push Button
<b>Exhaust</b>	15,600 RPM (adaptable with speed control)	3,100 RPM (non-adaptable)
<b>Electrical</b>	<ul style="list-style-type: none"> <li>• 115 VAC, 60Hz, 15 Amps</li> <li>• 220-240 VAC, 50Hz, 10 Amps</li> <li>• 100-200 VAC, 50/60Hz, 15 Amps</li> </ul>	<ul style="list-style-type: none"> <li>• 110-127 VAC, 60Hz, 10 Amps</li> <li>• 220-240 VAC, 50/60Hz, 5 Amps</li> <li>• 100 VAC, 50/60Hz, 10 Amps</li> <li>• 200-208 VAC, 50/60Hz, 5 Amps</li> </ul>
<b>Footprint</b>	<ul style="list-style-type: none"> <li>• 13.0 (W) x 23.0 (D) in (299 in<sup>2</sup>)</li> <li>• 33.0 (W) x 58.5 (D) cm (1931 cm<sup>2</sup>)</li> </ul>	<ul style="list-style-type: none"> <li>• 22.0 (W) x 23.3 (D) in (513 in<sup>2</sup>)</li> <li>• 55.9 (W) x 59.1 (D) cm (3304 cm<sup>2</sup>)</li> </ul>
<b>Weight</b>	62 lbs (28 kg)	68 lbs (31 kg)

### Easy-to-Use

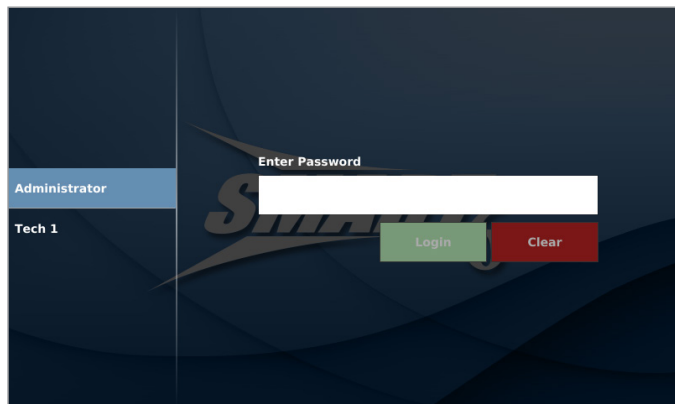


Simply add sample to balance and press “Start”.

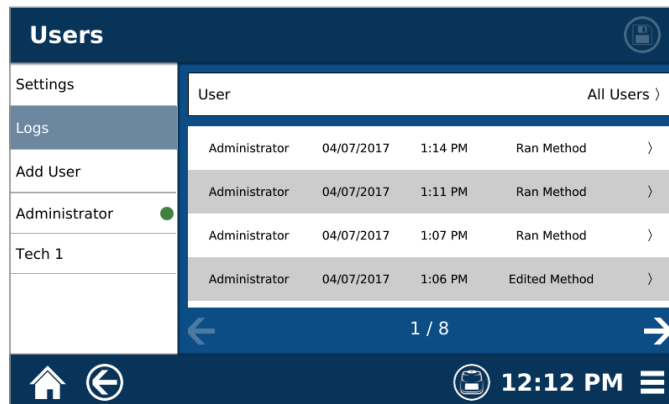


Access real-time run data.

### Full 21 CFR Part 11 Compliance

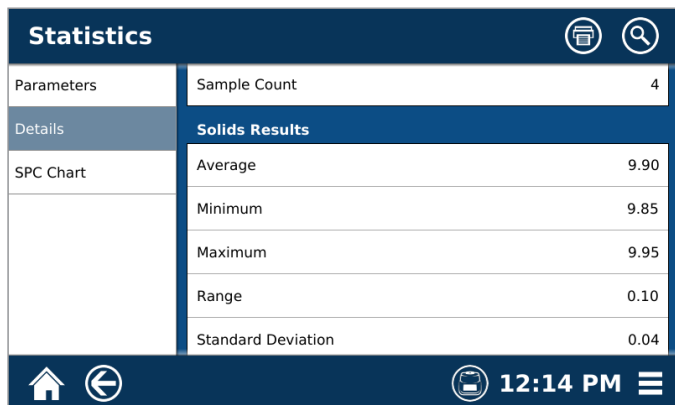


Protect data and methods with a hierarchy of user levels.

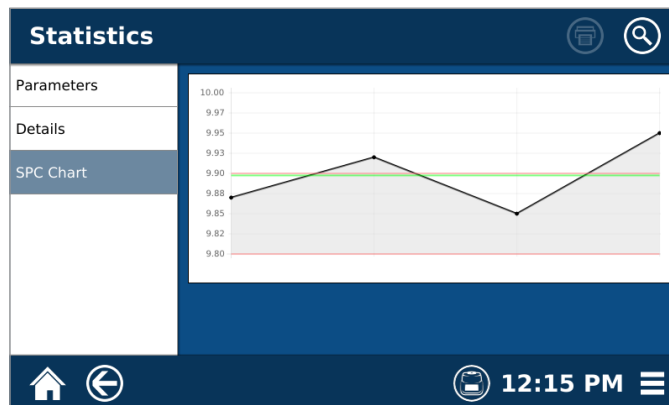


Review a complete audit trail with printable records.

### Monitor Production Trends



Create SPC charts with user specified limits.



Visualize trends directly on SMART 6 or LIMS network.

## Accessories



### Internal Printer

Thermal impact printer for printing sample results directly from the SMART 6. The printer is located inside the unit thereby not requiring extra space.

### Monitor Kit

Specialized solution with measured reference value for verifying SMART 5 or SMART 6 system performance.



### AutoCal

Simple and fast NIST traceable calibration for SMART 5 or SMART 6 IR temperature sensors.

### Exhaust Tubing

Exhaust tubing that can be connected to the back of the SMART 6 to remove volatile fumes to a desired location.





## **ORACLE** Rapid NMR Fat Analyzer





The first ever rapid fat analyzer with no method development.

## Overview

ORACLE is the first ever rapid fat analyzer that requires absolutely **no method development** for fat only analysis. At the touch of a button, ORACLE can analyze fat in any food sample with reference chemistry accuracy, without any prior knowledge of the sample matrix or composition. Simply press the run arrow and ORACLE delivers an exceptionally accurate and precise fat result in 30 seconds. Alternatively, ORACLE can be paired with the SMART 6 for combined rapid fat and moisture/solids analysis in less than 5 minutes.

## Awards

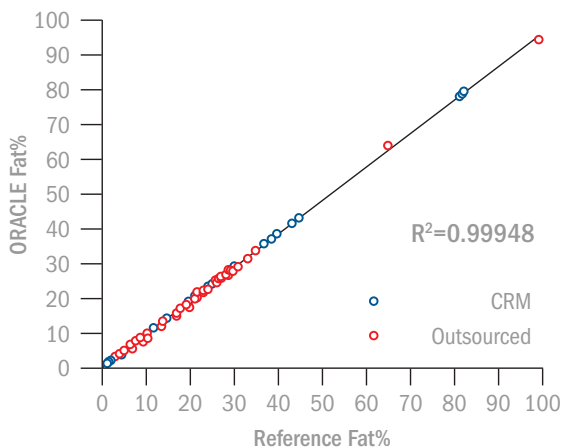
- 2017 IFT Food Expo Innovation Award
- Top 3 New Products at PITTCON 2017

## Features

- Rapid- 30 second analysis
- Analyze any sample from 0.05 – 100.00 % fat
- Direct isolation and measurement of hydrogen protons on fat molecules
- Precise- better repeatability than wet chemical extraction techniques

## Validation

- AOAC Official Method 2008.06 (Moisture and Fat in Meats)
- AOAC PVM 1:2004 (Moisture/Solids and Fat in Dairy Products)



## Accurate Analysis of Any Food Sample in Only 30 Seconds

ORACLE was verified with over 30 Certified Reference Materials (CRM's) sourced from Europe and USA. The blue data in the graph shows the linearity between the CRM reference results and the ORACLE rapid fat results. The red data in the chart shows the comparison between the outside lab reference results and ORACLE.

## No Method Development

ORACLE is the first ever rapid fat analyzer that requires absolutely no method development. At the touch of a button, ORACLE can analyze fat in any food sample with reference chemistry accuracy, without any prior knowledge of the sample matrix and composition. Simply press the run arrow, and in 30 seconds the ORACLE delivers an exceptionally accurate and precise fat result. It's really that simple.



## Sample Types

### Meats

- Beef
- Chicken
- Cod
- Duck
- Lamb
- Pork
- Salmon
- Turkey
- Venison

### Dairy

- Butter
- Cheese
- Cream (Heavy)
- Egg Whites
- Formula (Infant)
- Ice Cream Mix
- Milk
- Sour Cream
- Yogurt

### Processed Foods

- Chips & Crackers
- Coffee Creamer
- Cookies
- Dog Food
- Dough
- Dressings
- Mayonnaise
- Noodles
- Nutritional Drinks

### Powders

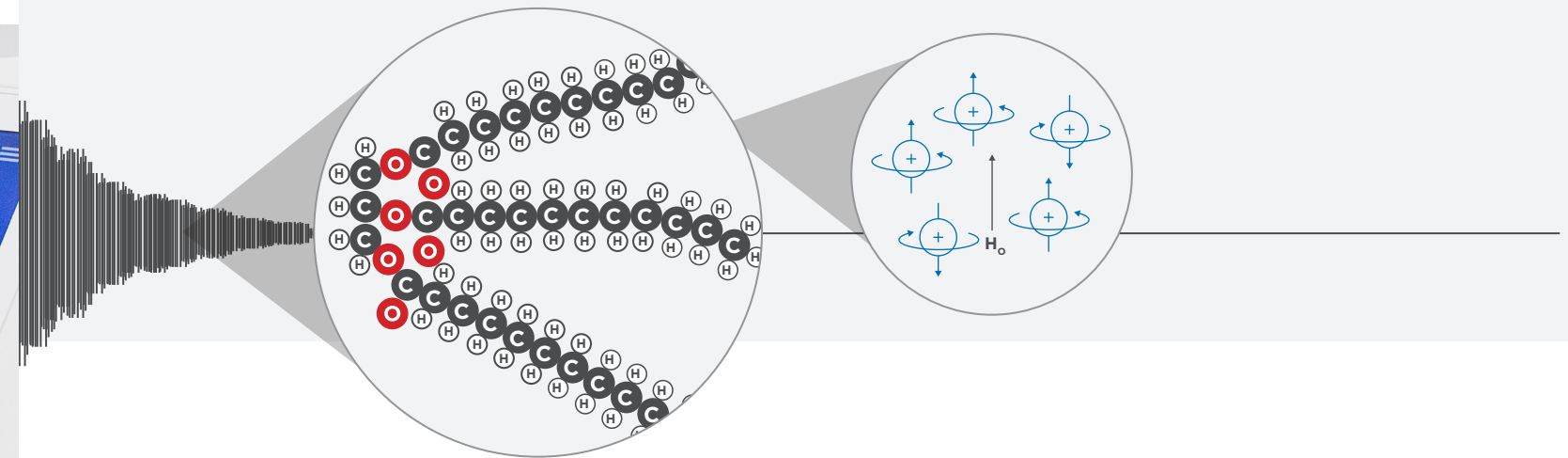
- Cheese
- Coffee Creamer
- Dairy
- Formula (Infant)
- Gravy
- Milk
- Non-Dairy
- Wheat Flour
- Whey

<sup>1</sup> Actalia is a COFRAC accredited laboratory that specializes in providing technical and scientific input into the validation and unification of analytical methods, with expertise in dairy analysis.



# A Major Breakthrough in NMR Technology

This newly developed technique, achieved in 2016, completely isolates the detection of the proton signal in fat molecules from all other compositional proton sources (i.e. protein, carbohydrate, ash) making universal fat analysis possible. Alternative rapid techniques are unable to fully isolate fat from other components, which is why extensive calibration development is often required.



## Consistent

All ORACLE systems are manufactured and designed to produce the same results worldwide, making the system an ideal solution for corporations seeking to standardize rapid instrumentation. Alternative rapid fat analyzers are susceptible to differences in optics and system components, which prevents them from transferring methods between various locations. That means that each system requires unique method development, which ultimately translates to extensive time and capital costs. Plus, there's no guarantee that the results will match. Not so with the ORACLE.

## Versatile

ORACLE is designed to operate in any lab setting, from process control in food production sites (at-line and in-lab) to certified testing laboratories. For labs seeking rapid moisture/solids analysis, in addition to fat analysis, the ORACLE can be paired with the newly developed SMART 6 analyzer for moisture/solids results in about 5 minutes. Alternatively, labs who run 50 or more samples per day may choose the stand-alone ORACLE high throughput solution, where samples are dried in an oven overnight, and subsequently run through the ORACLE in batch mode.



**ORACLE**  
Rapid NMR Fat Analyzer



**SMART 6**  
Microwave + Infrared  
Moisture & Solids Analyzer

## ORACLE Robot Automated High-Throughput Processing

Process up to 100 samples unattended. Analyze large batches on the ORACLE with the high-throughput robot accessory. The robot can be used with two high-throughput sample conditioning blocks. Data analysis is stored for each sample and can be reviewed at any time.







## Precision Heater Block

# High-Throughput Sample Conditioning

This accessory is effective for temperature conditioning large batches of up to 50 samples. Predry large batches in a vacuum or convection oven, and condition in a 50 place high-precision heater block. Individual samples can then be run sequentially on the ORACLE in less than 30 seconds.



## Sample Pads

These pads are tested to ensure they meet the requirements for absorbency, moisture content, and mechanical strength. They are approved for use in AOAC methods.



## Trac Film

Our proprietary Trac Film™ sample wrap consists of proton-free components designed to be used with the ORACLE system. Trac Film ensures an absolute minimum interference for fat determination by NMR. Each batch is individually tested to ensure that this standard is continuously met.



## ORACLE Tubes

These specialized tubes are for holding samples in the ORACLE.

Like Trac Film, ORACLE tubes are designed to minimize interference and ensure accurate fat analysis.



# Who we are

At our core, we are Chemists, Engineers, and Manufacturers, all under one big roof. Together, we passionately design and develop laboratory instruments that are used by major companies, prestigious research institutes, and universities around the world. We are proud of what we do, and we hope it shows. With over 50,000 instruments sold, you've probably used a product that has been tested with a CEM instrument. That fact motivates us to push harder to create better instruments, to help solve more problems for the scientific community of tomorrow.



## Founding Fathers (circa 1980)

- C**hemist: Dr. Michael J. Collins (**Middle**)
- E**lectrical Engineer: Ron Goetchius (**Left**)
- M**echanical Engineer: Bill Cruse Jr. (**Right**)

### 1978

CEM was founded and launched the world's first microwave drying system as the company's first product

### 1989

Introduced ultra-fast cooling quartz-fiber crucible technology for ashing

### 1985

Introduced ProFat™, a 5-minute fat analyzer for raw meat samples, without the use of chemicals

### 1984

Introduced a rapid microwave muffle furnace which is > 90% faster than traditional muffle furnaces



Greetings.

I feel very fortunate to be living the American Dream. CEM started 40 years ago, in a garage with two other people, and has grown into a major global scientific instrumentation company, now employing over 300 people worldwide. We have shipped more than 50,000 systems, which are being used in laboratories throughout the world. Our success is based on introducing new “disruptive” technologies, which have created significant value for the customers we serve.

We pioneered the field of microwave chemistry, which has been transformational in a number of key markets. Important applications include food testing, microwave digestion for elemental analysis, chemical synthesis for drug development, academic research, and solid phase peptide synthesis. In all cases, our systems have provided speed (hours to minutes), simplicity, and improved performance.

More recently, CEM introduced a new technology that is transforming food compositional testing. Our goal is to provide simple, rapid and direct methods that eliminate extensive calibration and can replace the classical, outdated wet chemistry techniques. Food testing, in particular, will continue to be a major focus of our new product development. CEM remains an entrepreneurial company that is nimble, flexible, innovative, and committed to serving the needs of our customers. We have a passion to be the very best at what we do. I am excited about the future and look forward to working with all of you as we continue to bring major new innovation to the food industry and the various other markets we serve.

Sincerely,

**Michael J. Collins PhD**  
President and CEO

2001

Developed the world's first combined microwave and NMR system for rapid fat analysis

2007

Developed the world's first automated protein analyzer based on a non-toxic dye binding technique

2016

Introduced a second generation NMR technology for fat analysis that eliminated method development

1998

Introduced infrared temperature control with microwave drying

2015

Introduced dual-frequency drying technology that reduced microwave drying times up to 40%

2013

Developed a rapid temperature conditioning process for fat analysis by NMR. This reduced preparation time from 20 – 60 minutes, down to only 30 seconds



We Simplify Science

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