Compositional Analysis

Processed Food Industry

Moisture/Solids

Fat

Protein

We Simplify Science

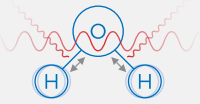
Safe and Easy Food Analysis

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.

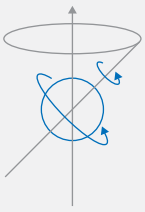
Key Technologies



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

"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.

"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

"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

"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

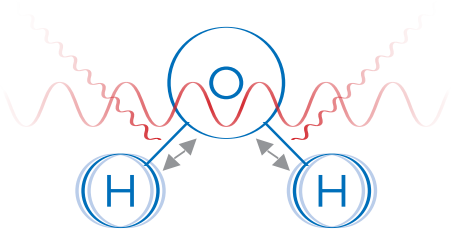
- Up to 40% faster than CEM's SMART 5 Turbo
- Analyze both dry and wet products on one system
- Preprogrammed methods for all sample types
- Compact and lightweight for easy at-line placement

Validation

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

Over 11,000 moisture analyzers sold worldwide

Dual-Frequency Drying

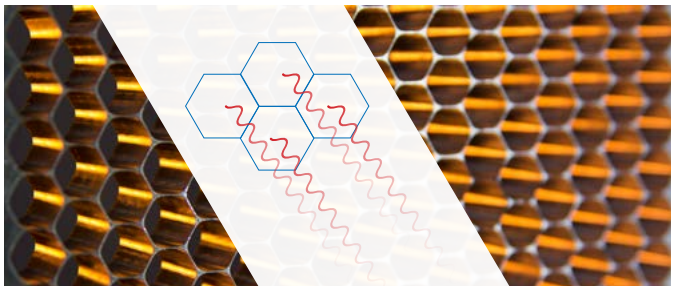


Analyze wet and dry samples with unmatched speed.

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

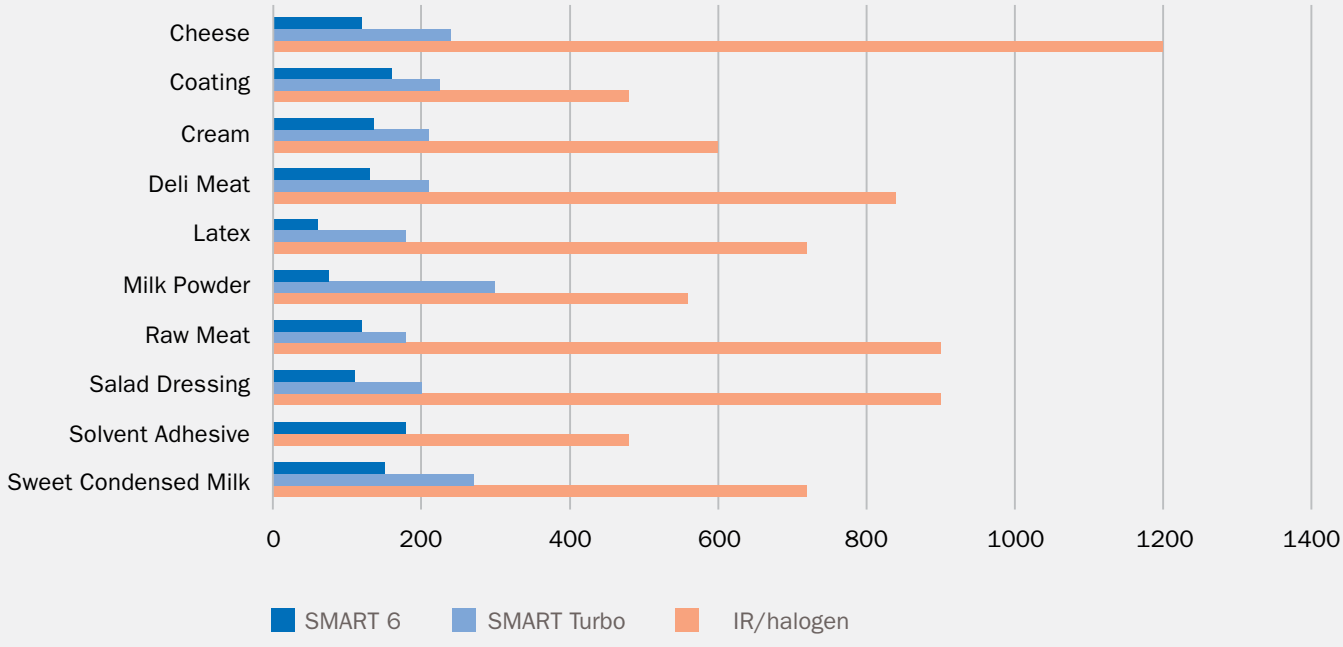


Accurate and repeatable results come standard.

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**

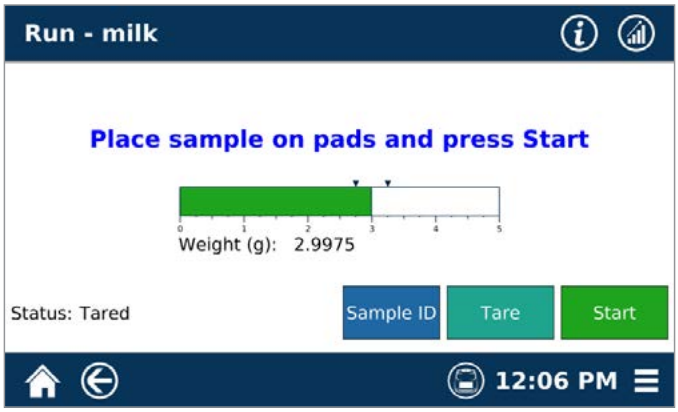
Time Comparison



System Comparison

	SMART 6™	SMART Turbo™
Removal Species	**Free + Bound Moisture** **Polar + Non-Polar**	Free Moisture Polar Volatiles
Moisture/Solids Range	**0.01 to 99.9%, 0.01% resolution** **(optional 0.001%)**	0.01 to 99.9%, 0.01% resolution (optional 0.001%)
Drying Energy	**Dual-frequency Electromagnetic** **Irradiation (iPower)**	Microwave Energy
Temperature Control	**Infrared**	Infrared
Balance	• **23 grams capacity** • **0.1mg readability**	• 23 grams capacity • 0.1mg readability
Thermal Nulling **(Buoyancy Compensation)**	**Enhanced with iPower**	Standard
Display	**7-inch capacitive LCD touchscreen** **(800 x 600)**	Black and White VGA (320x240)
Program/Data Storage	**Unlimited**	100 methods, 300 results
Data Analysis	**Advanced**	Standard
System Wake-up	**Proximity Detection**	Push Button
Exhaust	**15,600 RPM** **(adaptable with speed control)**	3,100 RPM (non-adaptable)
Electrical	• **115 VAC, 60Hz, 15 Amps** • **220-240 VAC, 50Hz, 10 Amps** • **100-200 VAC, 50/60Hz, 15 Amps**	• 110-127 VAC, 60Hz, 10 Amps • 220-240 VAC, 50/60Hz, 5 Amps • 100 VAC, 50/60Hz, 10 Amps • 200-208 VAC, 50/60Hz, 5 Amps
Footprint	• **13.0 (W) x 23.0 (D) in (299 in2)** • **33.0 (W) x 58.5 (D) cm (1931 cm2)**	• 22.0 (W) x 23.3 (D) in (513 in^2) • 55.9 (W) x 59.1 (D) cm (3304 cm^2)
Weight	**62 lbs (28 kg)**	68 lbs (31 kg)

Easy-to-Use

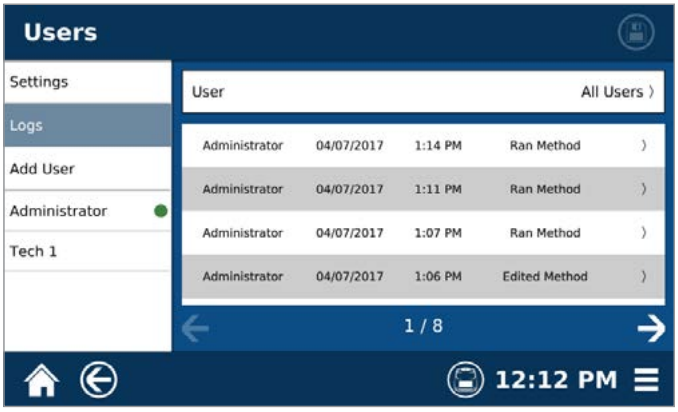


Simply add sample to balance and press “Start”.

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

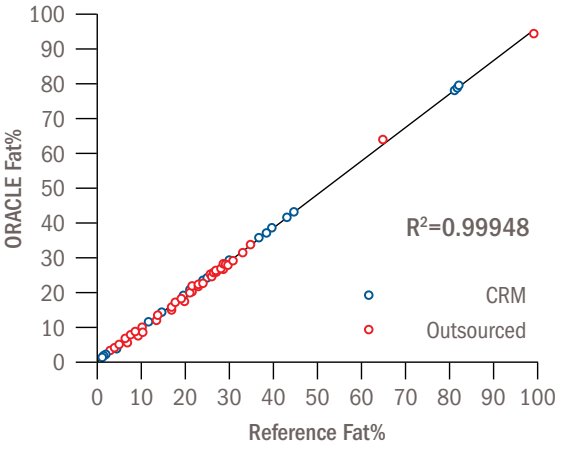
- 2017 IFT Food Expo Innovation Award
- Top 3 New Products at PITTCON 2017

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.

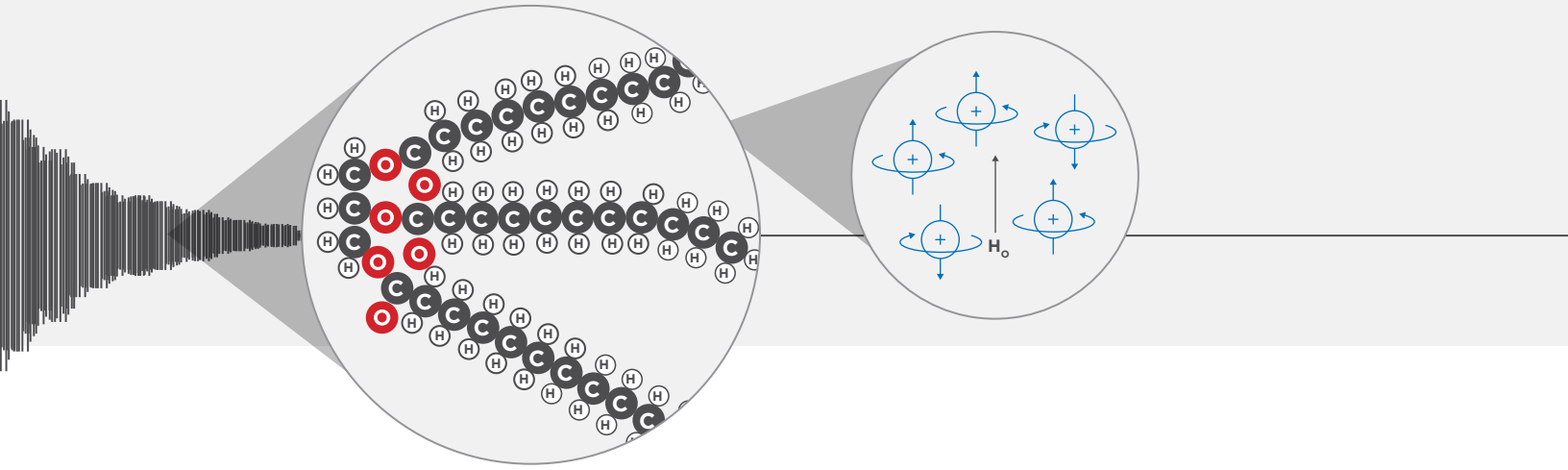
Sample Types

Meats	Dairy	Processed Foods	Powders
Beef	Butter	Chips & Crackers	Cheese
Chicken	Cheese	Coffee Creamer	Coffee Creamer
Cod	Cream (Heavy)	Cookies	Dairy
Duck	Egg Whites	Dog Food	Formula (Infant)
Lamb	Formula (Infant)	Dough	Gravy
Pork	Ice Cream Mix	Dressings	Milk
Salmon	Milk	Mayonnaise	Non-Dairy
Turkey	Sour Cream	Noodles	Wheat Flour
Venison	Yogurt	Nutritional Drinks	Whey

[1] 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

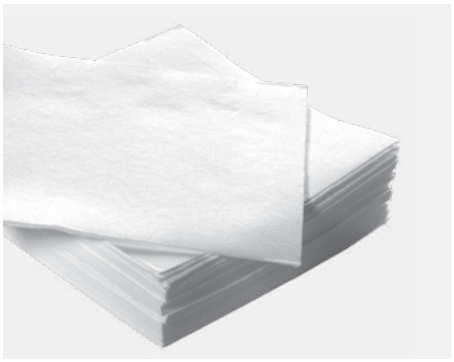
Automated High-Throughput Processing

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 **C**hemists, **E**ngineers, and **M**anufacturers, 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)

Chemist: Dr. Michael J. Collins (**Middle**)
Electrical Engineer: Ron Goetchius (**Left**)
Mechanical Engineer: Bill Cruse Jr. (**Right**)

1978

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

1984

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

1985

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

1989

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

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

1998

Introduced infrared temperature control with microwave drying

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

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

2015

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

2016

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

We Simplify Science

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