

# Overcome the challenges in Environmental applications.

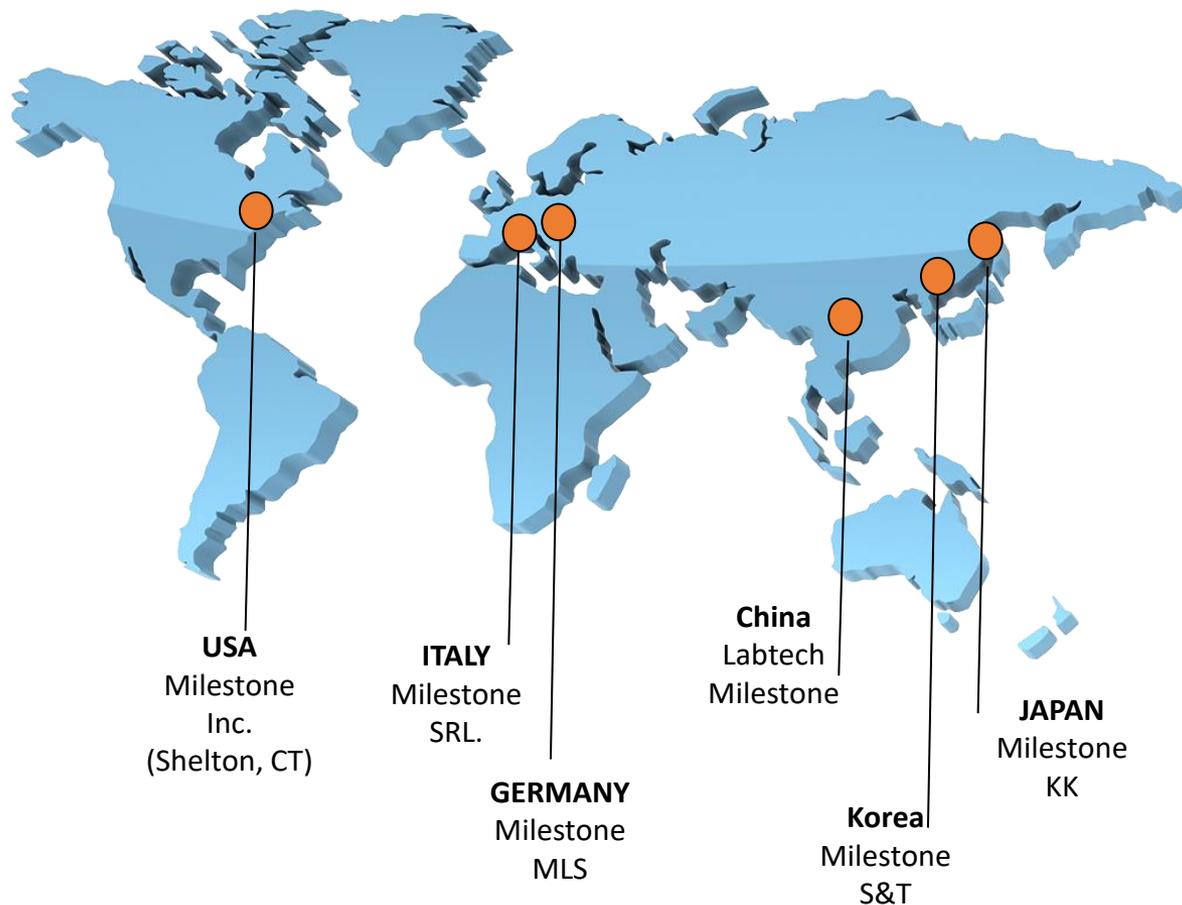
Latest solutions to improve productivity, ease of  
use and data quality in metals and pollutants  
determination



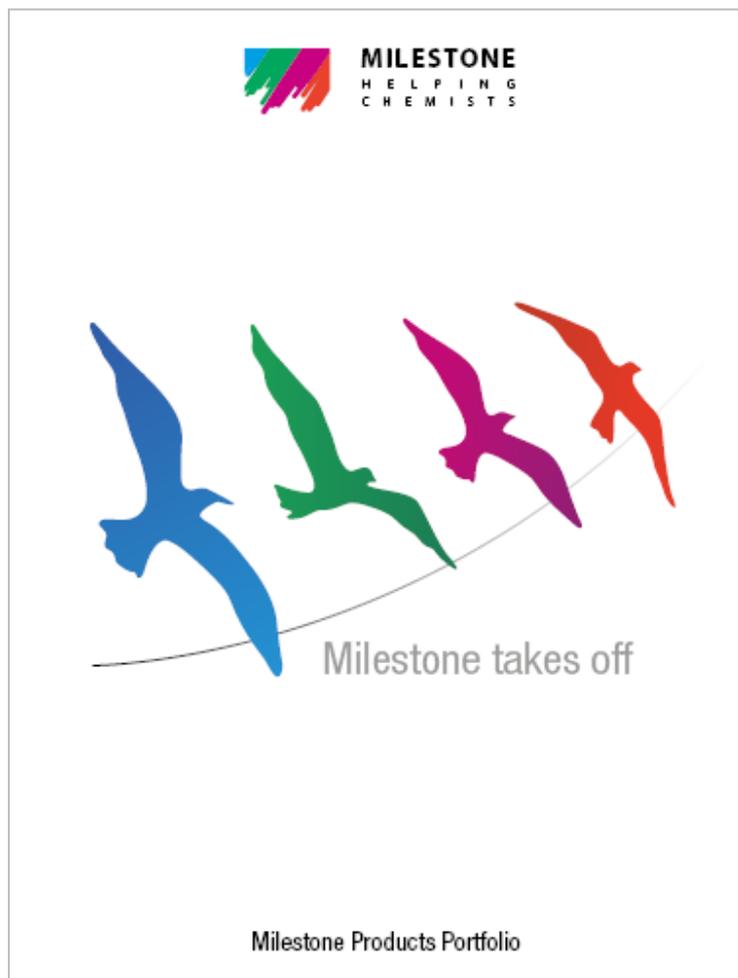
**MILESTONE**  
H E L P I N G  
C H E M I S T S

# About Milestone

- Established in 1988
- Headquarters in Italy, R&D and manufacturing in Germany and Switzerland
- A network of over 85 exclusive distributors worldwide



# Our Products



- Sample preparation
  - ✓ Digestion
  - ✓ Clean chemistry
  - ✓ Extraction
  - ✓ Ashing
- Analysis
  - ✓ Mercury
- Synthesis

# Trace metal analysis challenges

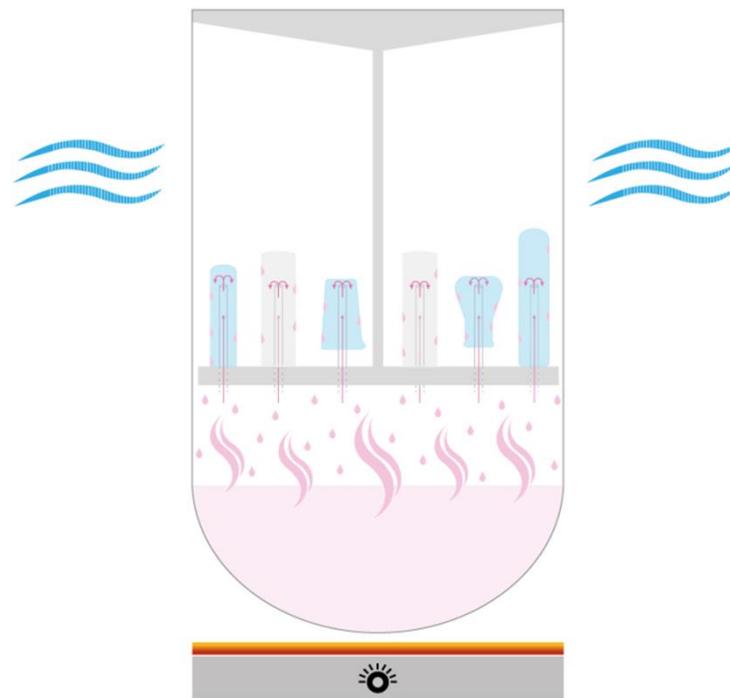
- Prevent contamination from materials used, reagents and environment
- Interferences caused by complex matrices
- Losses during sample prep

Better blanks make it realistically feasible to reach lower concentration



# Steam Cleaning method

- Steam cleaning with  $\text{HNO}_3$  vapors is very effective for routine cleaning
- Containers/ flasks are placed on rods
- Acid is placed in the acid reservoir and heated
- Acid vapors goes through the rods and clean the containers, removing the contamination

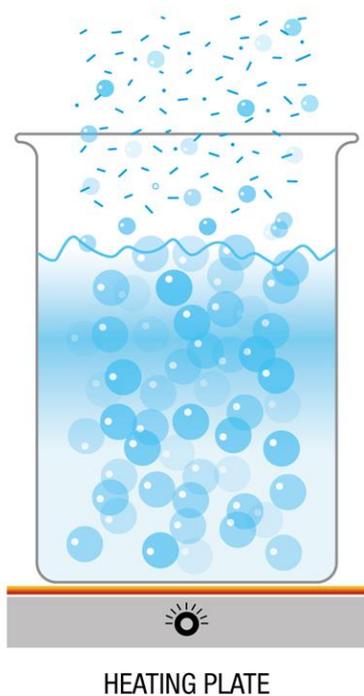


# TraceCLEAN Benefits

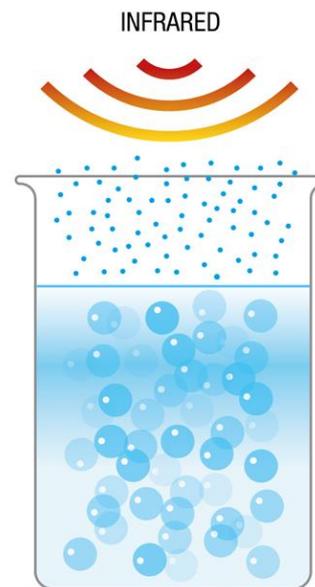
- Unattended cleaning of all Teflon<sup>®</sup>, glass and quartz items, including microwave digestion vessels and ICP accessories
- Fast (less than 1 hour compared to 8-12 hours recommended by the official methods)
- Use preset programs or create and store your own method
- Built-in exhaust/cooling reduces exposure to acid vapors and PTFE-coated stainless steel compartment assures system durability and prevents use-to-use contamination



# Trace Analysis Reagents



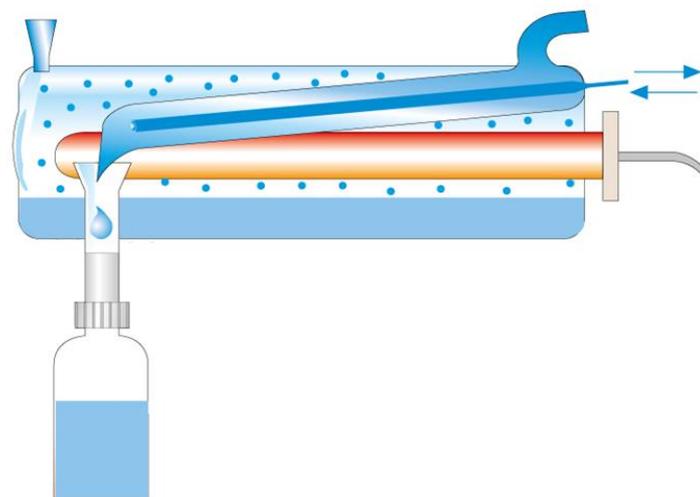
Conventional  
distillation



Sub-boiling distillation

# Sub-boiling distillation system

- Sub-boiling distillation uses infrared heaters
- Infrared heating vaporize the surface liquid
- Vaporized liquid is condensate by a cooling system



Vaporization without boiling prevents aerosol with particles/  
contaminates

# Milestone DuoPUR

## Quartz sub-boiling distillation system

- Double Quartz sub-boiling system
- High productivity
- Up to 90% cost saving of ultra-pure acid
- Water cooling
- Suitable for  $\text{HNO}_3$ ,  $\text{HCl}$ ,  $\text{H}_2\text{O}$



# Latest innovation in microwave sample preparation for metals and organic contaminants



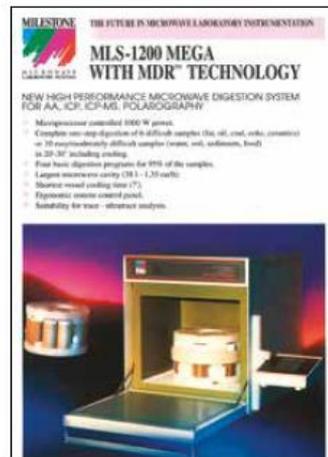
**MILESTONE**  
H E L P I N G  
C H E M I S T S

# The evolution of the microwave technology

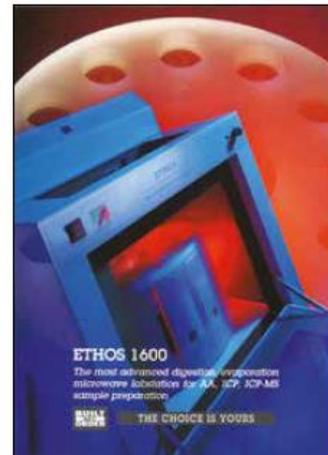
## Our milestones



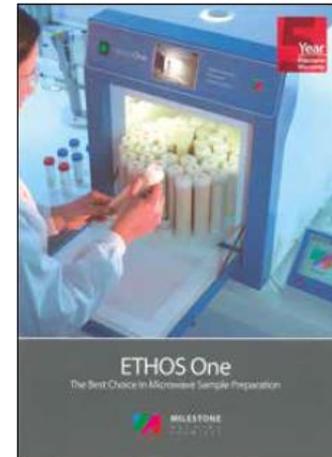
MLS-1200  
1989



MLS Mega  
1991



ETHOS 1600  
1998



ETHOS One  
2010

# UltraWAVE

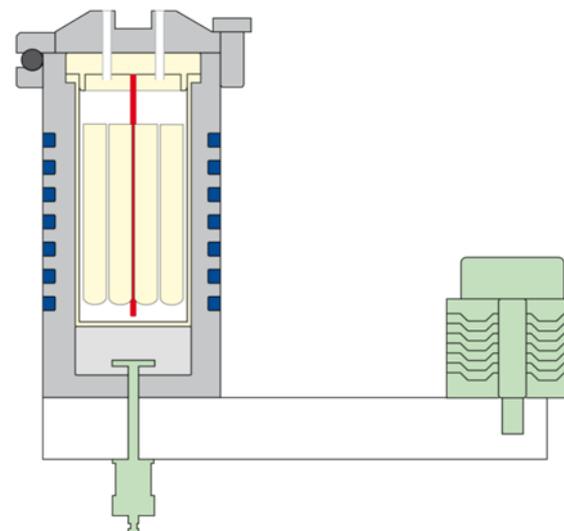
## Single Reaction Chamber technology

- **Easy handling**
  - No assembly/disassembly of vessels
  - No cleaning- ability to use disposable vials
- **Digest completely mixed sample matrices simultaneously**
  - One run for all sample type
- **Highest Temperature and Pressure Available**
  - Max. pressure 199 bar, max temp. 300deg.C
  - Digest even the most difficult/stable samples
- **Extreme Productivity**
  - High sample throughput
  - One digestion program for everything
- **Lower operating costs**
  - Reduced labor and consumables costs



# SRC Design - UltraWAVE

- 1L stainless steel reaction vessel With 900mL PTFE reactor
- Sample rack is lowered into the chamber and into a base load All samples digested together under same temperature and pressure. Direct T and P sensors continuously control the digestion parameters.
- Whole chamber is pressurized Nitrogen pressure avoid sample loss ; Vials are closed with loose fitting covers
- Fast water cooling A chiller quickly cool the reactor using a water chiller



For the first time, a microwave controls the temperature and pressure in every vessel regardless of sample type or acid chemistry being used!



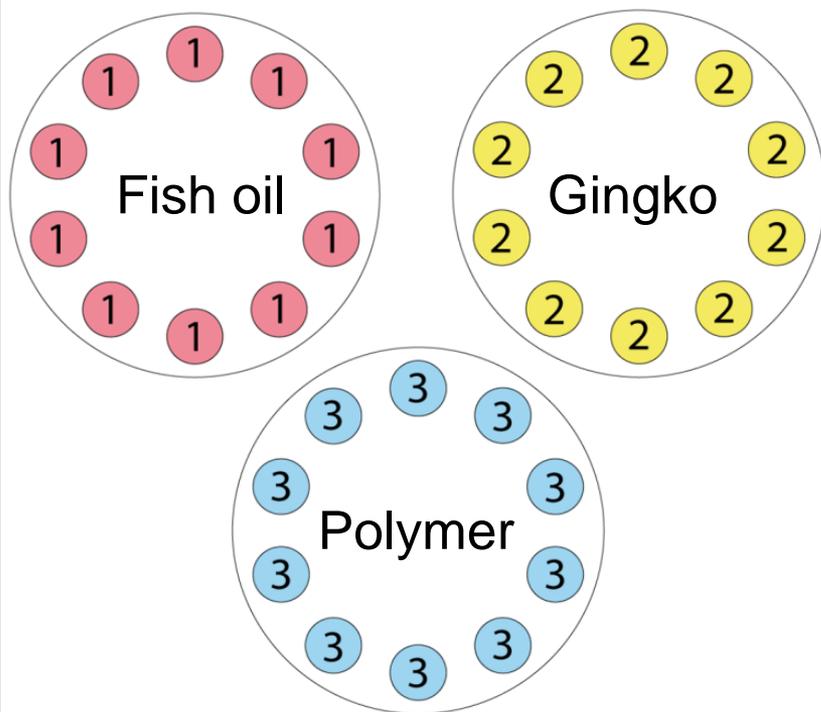
# Sample Racks and Vials

- Wide choice of sample rack
- No need to close and open the vials thanks to the pressure loaded before the run
- Vials available in Quartz, TFM or ***disposable glass***

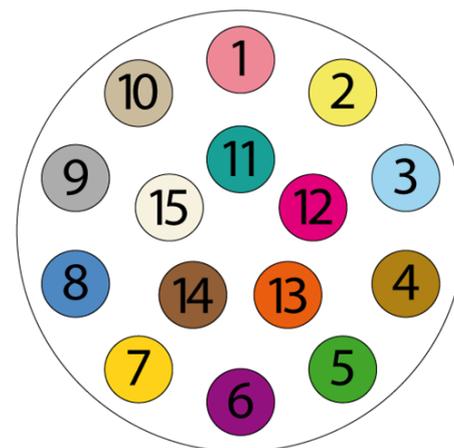


# Workflow Efficiency Comparison

“Conventional” Closed vessel digestion protocol



Milestone UltraWAVE



One run for 15 mixed samples  
(simultaneously)  
Such as Polymer, fish oil, gingko

With UltraWAVE, no batching or waiting until rotors are full

# Recovery studies

Digestion of seven different matrices with 4ml HNO<sub>3</sub> or 4mL HNO<sub>3</sub>  
+ 1mL HCl

	<b>Arsenic</b>	<b>Mercury</b>	<b>Cadmium</b>	<b>Lead</b>
<b>DORM-4 Fish Protein</b> (Certified values)	6,8 (6,845±)	0,41 (0,395±)	0,306 (0,301±)	0,42 (0,481±)
<b>Cheese</b>	44,846	3,808	62,336	132,025
<b>Apple leaves</b>	0,021	0,023	0,088	0,09
<b>Ginko Capsule</b>	611,428	6,535	48,471	95,679
<b>Vitamin Supplement Tablet</b>	1398,812	6,506	16,686	503,238
<b>Carbon Black</b>	172,711	22,112	7,758	567,167
<b>Packaging material</b>	7722,711	1,406	5,625	901,876

Concentration in ppm

# Introducing the Milestone Ethos X



# Ethos X- US EPA 3546

- Chlorinated pesticides
- Semivolatile organics
- PAHs
- PCBs
- Chlorinated herbicides (phenoxyacid herbicides)
- Phenols
- Organophosphorus pesticides and chlorinated herbicides
- Dioxins and furans

# The heart of the Ethos X: FastEX 24

- High sample throughput (24 samples simultaneously)
- Easy handling
- Large disposable glass vials (100ml)
- Great temperature homogeneity through a unique vessel material (modified PTFE)
- Contactless temperature control
- Minimum solvent usage
- Low running costs
- Based on the official methods US EPA 3546



# Load sample, solvent and Seal the vessel



Load the sample



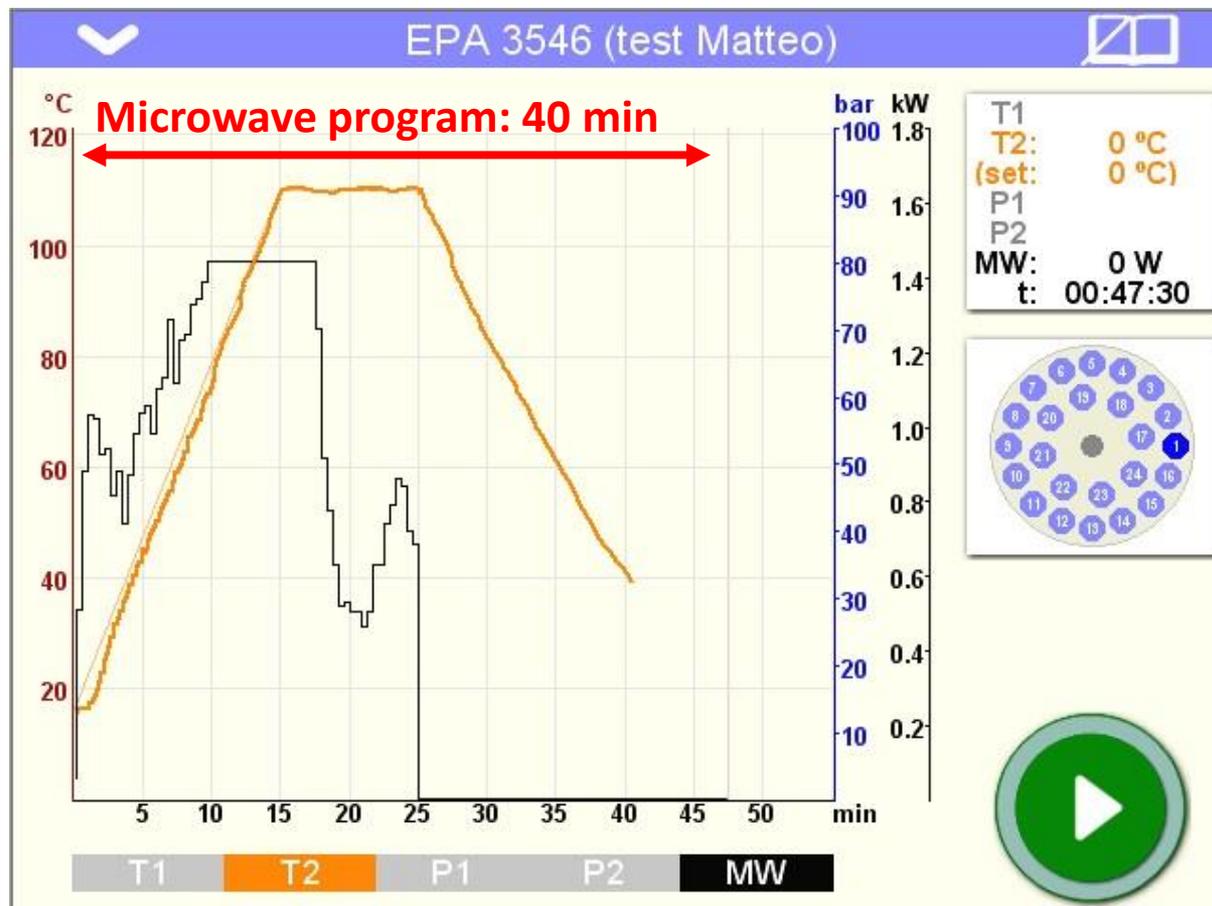
Add the solvent



Vessel closing

# Run the microwave program

24 samples in 40 minutes



# High Throughput – disposable glass vial

- No cleaning
- No memory effect
- Low running cost
- Large volume 100 ml
- Large volume allow extraction of large sample amount, up to 30g



# PCBs recovery study

PCB Cogener	Certified value (mg/kg)	Ethos X (mg/kg)	Recovery (%)	RSD (%)
PCB 101	93	74	80	1.75
PCB 118	116	86	74	4.94
PCB 138	16	14	88	0.2
PCB 153	19	17	89	3.2
PCB 180	9.6	10	104	2.6

*PCBs recovery from 1g sandy loam soil standard reference material (LGC6115)*

# Milestone Tools for Trace Metal Analysis and Sample Preparation



Thank you for the attention!