

SCP SCIENCE

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A NEW CATEGORY OF AUTOMATED MICROWAVE DIGESTION

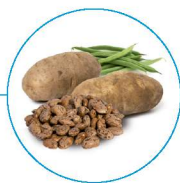
NovaWAVE



US PATENT NUMBER 8,454,910 B2



PETROLEUM



AGRICULTURE



GEOLOGY



ENVIRONMENT



TEXTILES

INCREASE THROUGHPUT - DIGEST UP TO 168 SAMPLES
MIXED SAMPLES IN THE SAME RUN OR CREATE INDIVIDUAL METHOD PER VESSEL
– COMPLETE FLEXIBILITY AT YOUR FINGERTIPS
MULTIPLE SAFETY FEATURES – PROTECTION FROM “RUNAWAY” SAMPLES

NovaWAVE is a new, fully automated, sample digestion tunnel employing 12 dynamically created microwave minicavities to simultaneously process 12 samples in Quartz or Fluoropolymer vessels. **NovaWAVE** is available in two models:

Model SA: A Stand Alone **NovaWAVE** Microwave Tunnel Digestion System with all available software and operational parameters including the flexibility of unique, individual method assignments for each sample in a 12 sample rack.

For labs with limited samples, the **Model SA** is the instrument of choice. Speed and flexibility are built-in with the capability of running a rack of samples with individual sample temperature programs. Simultaneously, digest water and soil samples in the same rack with an optimized digestion program employed for each sample. **Model SA** can be upgraded at any time to a full **Model FA** through the acquisition of the Transporter and additional racks, vessels and Fluoropolymer caps.

Model FA: A Fully Automated **NovaWAVE** Microwave Tunnel Digestion System with all the software and operational parameters

employed in the **Model SA**; plus the Transporter, Auto-Cooling and Auto-Venting Stations to complete the automation. The **Model FA** provides unattended, automatic processing of up to 14 racks totalling 168 samples. Racks can be left on the Transporter after processing, as in an after-hours run, or removed immediately for sample analysis once the rack leaves the Auto-Venting Station.

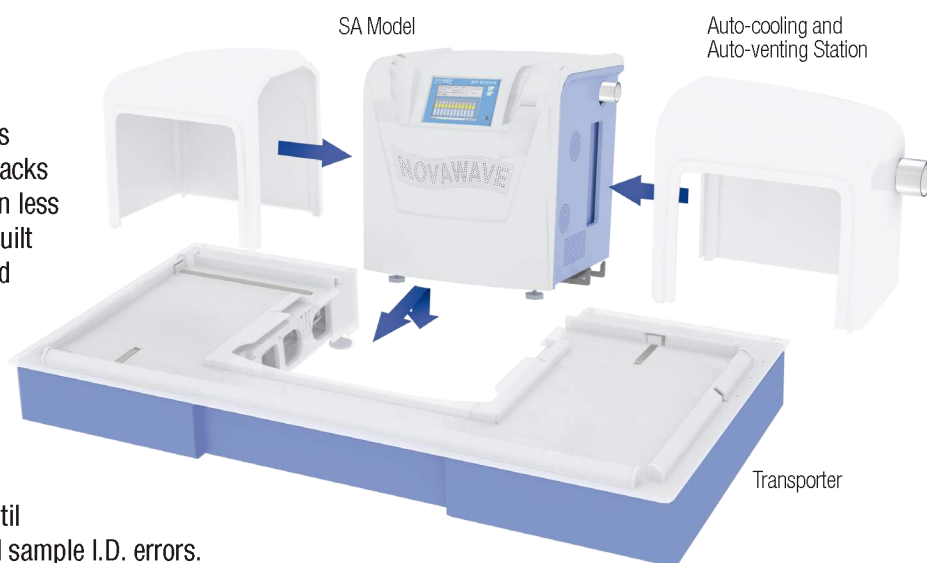
Laboratories with a large number of samples can enjoy the same method flexibility as the **Model SA** throughout the entire 14 racks of 168 samples. Sample vessels are placed in racks which are moved under software control into the microwave tunnel. Dynamically, 12 microwave mini cavities are formed and energy is delivered to each mini cavity according to the digestion method selected. On exiting the tunnel, the rack proceeds to the Cooling Station and a second rack enters the tunnel to begin its digestion sequence. Once digestions in the second rack are completed, it moves to the Cooling Station with the first rack moving to the Auto-Venting Station. Here, vessels are safely vented automatically when they reach a pre-assigned temperature pre-set in the method.

- Use a new or stored method for each sample
- Process up to twice as many samples per day compared to conventional microwave digestion systems
- Control temperature of each sample independently
- Digest 12 samples simultaneously in 10 minutes or less
- Digest, cool and vent 168 samples completely automatically - no human intervention
- Independent and unique sample digestion tunnel, auto-cooling and auto-venting stations

THROUGHPUT

High sample throughput with the **NovaWAVE FA** is achieved through unique design and full automation. Racks can be prepared with 12 vessels of weighed samples in less than a minute through conveniences and automation built into the rack design. Post digestion, samples are cooled and vented external to the tunnel maximizing the time the tunnel is available for additional samples. Samples are simultaneously digested, cooled, and vented automatically as others are being analyzed providing a continuous, uninterrupted production from sample weighing to analysis. Using calibrated vessels, a sample stays with its tube from weighing until analysis eliminating sample transfer time and potential sample I.D. errors.

Assuming a 1 minute weighing time, a 10 minute digestion time, a 1 minute normalization time, and a 1.5 minute analysis time, 276 samples can be processed from weighing, through the **NovaWAVE**, and analyzed by ICP- AES or MS in an 8 hour shift. In addition, 168 samples can be loaded at the end of the day, digested over night, ready for further processing in the morning.



OPERATION, CONTROL AND FEEDBACK

The *NovaWAVE* Digestion System is operated through the intuitive and informative touch screen interface. Operating parameters and method selection are programmed through simple, single touch entries and drop down menus.

Security, data and method integrity are achieved through password protected, multi-level access which allows for different permissions for operators, administrators, and service personnel.

The operation starts when a rack of 12 samples enters the tunnel and is identified by the rack reader. This information is transferred automatically to the controller which then assigns the appropriate digestion method to each sample or rack as requested in the program. Power is directed to each sample through individual sample mini cavities in response to the pre-set temperature profile programmed in the method. Each



sample temperature is monitored by its respective IR sensor providing feedback to the controller which instructs each mini cavity solid state, power supply module to direct more or less energy as required. Microwave power is continuously variable providing seamless, precise temperature control to each sample independently. A dynamic, visual display of all 12 sample temperatures is provided.



METHODS

The most popular EPA and DIN Methods are pre-installed in the *NovaWAVE* software package. Operators can edit, copy and add new methods through the user friendly, color touch screen. Methods can be created, changed or modified while samples are in the digestion process adding to process efficiency and improving sample throughput.

Different types of samples may require different methods. To provide maximum flexibility in optimizing methods, multiple "Time to Temperature" and "Time at Temperature" plus "Direct to Temperature" profiles can be included in each method. Methods can be assigned in 3 ways:

CYCLE: All samples in a run of up to 14 racks can be assigned the same method.

RACK: All samples in an individual rack can be assigned the same method.

SAMPLE: Each individual sample in a rack can be assigned a

Digestion	Methods	Reports	System	Options	Logout
Save Load		Method: Multi-method Vessel Type: Teflon			
Cycle 1		Sample IDs			
Rack 1		1 2			
Rack 2		3 4			
Rack 3		5 6			
Rack 4		7 8			
Rack 5		9 10			
Rack 6		11 12			
Cycle 2		Sample List			
Rack 1					
Rack 2					
Rack 3					
Cycle 3					
Rack 1					
Add cycle		Add rack		Delete	Door Start
15:26:01 Show keyboard					

different method.

The software provides automated method switching from rack to rack, or sample to sample using an unlimited number of user-created or pre-installed methods which are assigned to either individual samples or all samples in the rack. When rack identification is made in the tunnel, the information is transmitted to the Run file which then automatically assigns the appropriate method to the individual sample, or all samples, in the rack.



Acid resistant polymer

User friendly interface

Exhaust

USB port

Stainless Steel Tunnel

Rack

Mini cavities

IR sensor

Transporter module

Fluoropolymer vessels

RACK and VESSELS

Racks can accommodate:

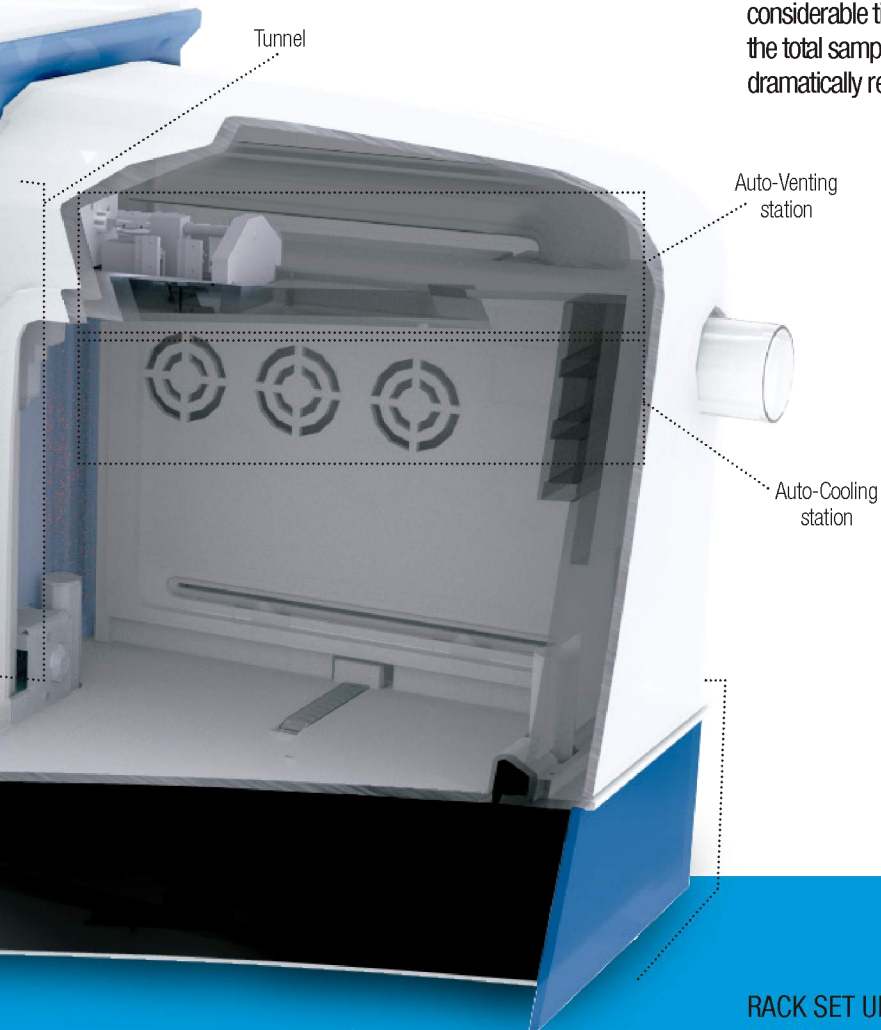
- 12 calibrated Quartz Vessels, 50 or 75 ml, or
- 12 Fluoropolymer vessels, 50 or 75 ml

Calibrated Quartz Vessels can be used throughout the sample preparation process (digestion, normalization, analysis) avoiding labor, time and potential contamination in transferring samples. Compared to Fluoropolymer, Quartz Vessels are more economical, last longer and contribute less potential cross contamination. Fluoropolymer vessels are essential when using HF.



Quartz vessels

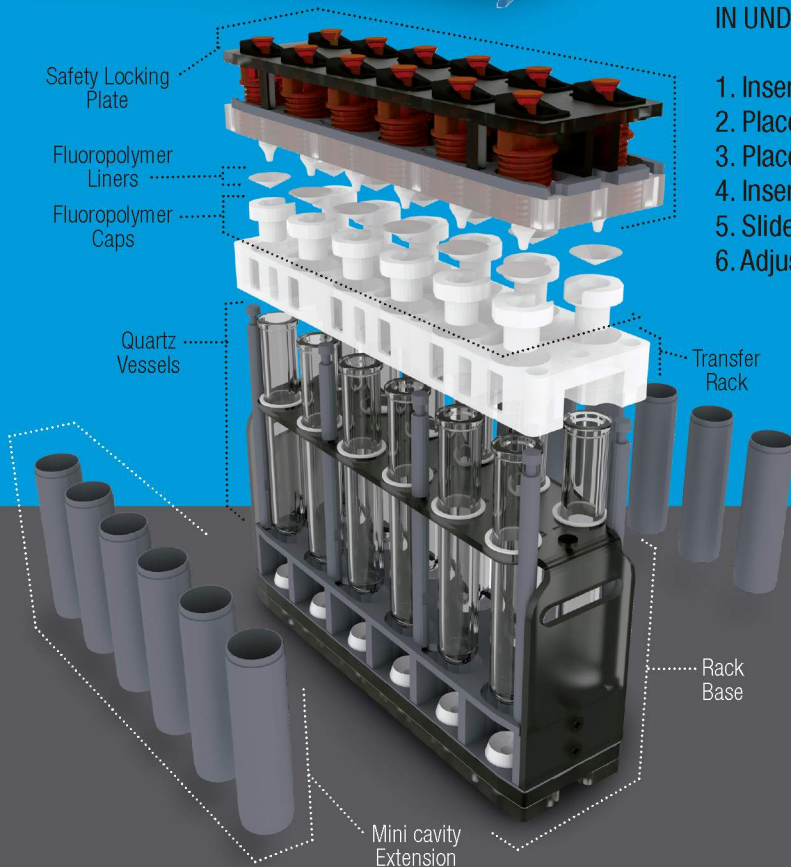
The functionality of the *NovaWAVE* vessels and rack save considerable time compared to other systems and enhance the total sample throughput time through automation while dramatically reducing operator involvement.



RACK SET UP IS ACCOMPLISHED IN 5 SIMPLE STEPS
IN UNDER A MINUTE:

1. Insert 1 to 12 vessels into a rack base
2. Place a Fluoropolymer Cap on each vessel
3. Place the Fluoropolymer Cap liner on each vessel.
4. Insert the Safety Cap Plate on the 10 uprights to rest on the Teflon® Caps
5. Slide the Safety Locking Plate forward securing the vessels
6. Adjust the Safety Caps to touch the Fluoropolymer Caps

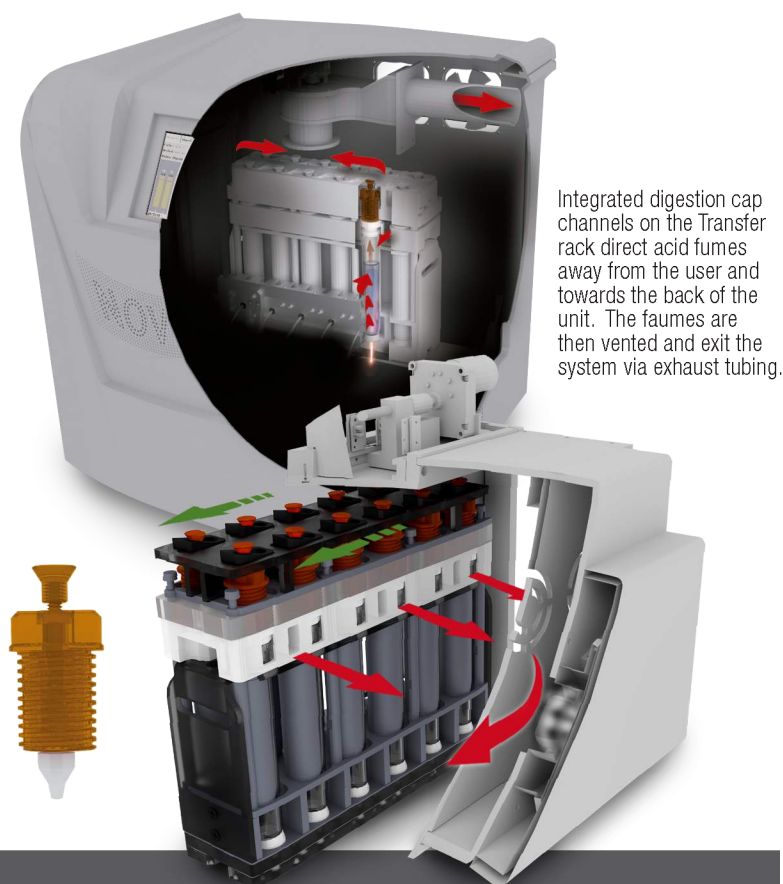
The rack is ready for processing!



SAFETY and PROTECTION

Safety features for both operator and instrument have been employed throughout.

Safety Caps, positioned above each vessel, are set at a predetermined pressure safeguarding against vessel over-pressurization. During a digestion, should the internal pressure in a vessel reach the pre-set value, the Safety Cap releases and the vessel will vent automatically. To prolong their useful life, most exposed instrument and accessory components are Fluoropolymer coated or manufactured with materials resistant to corrosion and acid attack. All pressurized containers and components involved in pressure vessels have been pressure tested and are rated 3.5 - 4 times greater than their prescribed use.



Integrated digestion cap channels on the Transfer rack direct acid fumes away from the user and towards the back of the unit. The fumes are then vented and exit the system via exhaust tubing.

SAFETY FEATURES INCLUDE:

Safety Cap over-pressure detection with auto-venting

Automatic power shutdown of a mini cavity when a vessel is not present

In the event of tube breakage, power is shutdown to the mini cavity in milliseconds

In the event of a "runaway" sample, over temperature protection is assured with automatic power shutdown to the mini cavity

Safety messages and auto shut down for mechanical occurrences such as blocked doors, etc.

COMMUNICATION

Sample identification can be uploaded directly to the Rack file via a PC connection or directly linked bar code reader. Sample ID's can be matched with the quartz vessel bar codes if appropriate vessels have been selected.

Reports can be downloaded to a USB flash drive or through the system's Ethernet port to a laboratory computer or LIMS for data processing and storage.



SAMPLE DIGESTION REPORTS INCLUDE FOR EACH SAMPLE:

- Rack and Sample I.D.
- Digestion method used
- Sample Weight or Volume
- Temperature vs. time profile
- Maximum temperature achieved

The Ethernet and USB ports can also be used for remote diagnostics and software upgrades.

SPECIFICATIONS

Electrical Requirements

200-240VAC, 50-60Hz, 25A.
Detachable power cord, I.E.C.
and UL approved.

Microwave Energy

2.45 GHz;
12 x 2 50 W;
Continuous linear power levels delivered to 12
microwave minicavities under software control
using IR temperature sensor feedback.
Maximum controllable temperature of up to 200 °C .

Ports/Printer

USB/ Ethernet.

Overall Instrument Dimensions

(Width x Height x Depth)

Stand Alone with wings:
57.5" x 29.5" x 24.4"
(145cm x 75cm x 62cm)
Fully Automated: 64.5" x 29.5" x 31.0"
(164cm x 75cm x 79cm)

Weight

Stand Alone: 148 lb (67 kg)
Fully Automated: 254 lb (115 kg)

CERTIFICATIONS:



NRTL
Listed



APPLICATION NOTES LIBRARY

Are you digesting environmental, metallurgical, food, plant or oils samples in your laboratory and not obtaining good results? Our Applications Specialist may answer your questions and provide insight on how to increase sample throughput, optimize recovery levels or improve your methodologies. At **SCP SCIENCE** we are dedicated to finding a solution to your sample digestion needs.

A growing library of **NovaWAVE** application notes is becoming available. Each of the notes demonstrates the ease of use and effectiveness of **NovaWAVE**. Recent application notes include:

- The Digestion of Bovine Liver
- The Digestion of Polypropylene Plastic
- The Digestion of Soil Samples
- The Digestion of Lead in Paint
- The Digestion of Peach Leaves
- The Digestion of **CONOSTAN** oil based S-21 Standard

Contact your local Sales Representative or Distributor for more information.

ORDERING INFORMATION

Two ways to purchase a **NovaWAVE**:

NovaWAVE SA

Stand alone Microwave Tunnel Digestion System with software and hardware to digest 12 samples simultaneously. Racks, Vessels and Fluoropolymer cap liners are ordered separately.

NovaWAVE FA

Fully Automated Microwave Tunnel

Digestion System with software and hardware to digest up to 168 samples automatically in a single run; includes the Model SA, Transporter with a capacity of up to 14 Racks, Auto-Cooling and Auto-Venting Stations. Racks, vessels and Fluoropolymer caps ordered separately.

NovaWAVE can be purchased as a Stand Alone SA and converted at any

time to a Fully Automated FA model by purchasing the Transporter Accessory and additional racks, vessels, Fluoropolymer cap liners and Fluoropolymer caps.

DESCRIPTION	QTY	CATALOG NO.
NovaWAVE Stand Alone (SA) Microwave Tunnel System, complete with entry/exit platforms	Each	010-600-001
NovaWAVE Fully Automated (FA) system complete with Transporter, Auto-Cooling and Auto-Venting stations	Each	010-600-002
Transporter with Auto-Cooling and Auto-Venting stations (required to upgrade model SA to FA)	Each	010-600-003
Rack Complete, 50 ml, Quartz, SA	Each	010-600-055
Rack Complete, 75 ml, Quartz, SA	Each	010-600-075
Rack Complete, 50 ml, Teflon®, SA	Each	010-600-057
Rack Complete, 75 ml, Teflon®, SA	Each	010-600-077
Rack Complete, 50 ml, Quartz, FA	Each	010-600-155
Rack Complete, 75 ml, Quartz, FA	Each	010-600-175
Rack Complete, 50 ml, Teflon®, FA	Each	010-600-157
Rack Complete, 75 ml, Teflon®, FA	Each	010-600-177
Quartz vessel, 50 ml, calibrated	(Pk/6)	010-600-051
Quartz vessel, 75 ml, calibrated	(Pk/6)	010-600-071
Teflon® PFA vessel, 50 ml	(Pk/6)	010-600-053
Teflon® PFA vessel, 75 ml	(Pk/6)	010-600-073
Support Sleeves for 50 ml Teflon® vessels	(Pk/6)	010-600-054
Support Sleeves for 75 ml Teflon® vessels	(Pk/6)	010-600-074

DESCRIPTION	QTY	CATALOG NO.
PFA Teflon® caps for Quartz vessels	(Pk/6)	010-600-028
PFA Teflon® caps for PFA Teflon® vessels	(Pk/6)	010-600-027
Teflon® Liner with Plunger	(Pk/6)	010-600-020
Spacer Rack (14 positions less the number of racks ordered equal the number of spacer racks required)	Each	010-600-017
Barcode reader	Each	010-600-034
Startup kit SA / MiniWAVE	Each	010-600-120
NovaWAVE and MiniWAVE Exhaust Hose Assembly 2.5 in. (65 mm)	10 ft	010-600-081
NovaWAVE Transfer Rack Stand	1	010-600-040
Mixing Cap for Microwave vessel	1	010-600-100
Venting Tool for NovaWAVE SA and MiniWAVE Safety Pressure Caps	1	010-600-070
Weighing Support for Quartz vessel	1	010-600-110
Weighing Support for Teflon® vessel	1	010-600-115
DigiFILTERs Evaluation Kit	1	N/A



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NovaWAVE instruments and accessories are covered by US Patent Number 8,454,910B2, 8,845,983 and 8,852,534 and patent applications in other countries. The products are manufactured under the proprietary technology of **SCP SCIENCE** (Canada).

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