

Shortcomings of conventional ashing furnaces



The determination of ash content, whether for process control or as a preparation method for other analytical techniques, is an important test performed daily in thousands of laboratories. While ashing is a relatively simple process, conventional muffle furnaces are inefficient in a number of respects which often leads to the process being tedious and time consuming. An alternative to muffle furnaces, electrical resistance furnaces, are typically costly to maintain due to high energy consumption. Additionally, both of these types of instruments have a tendency to diffuse heat making the surrounding laboratory environment uncomfortable due to heat and odors.

Introducing the PYRO XL, a microwave ashing system for extra large sample amounts



The application of microwave technology to dry ashing procedures has presented a breakthrough in the process and quality control of samples like polymers, petroleum, food and feeds, pulp paper and pharmaceuticals.

However, the ashing of high volumes of these types of matrices, which generally tend to generate a high quantity of fumes, have been challenging. The fumes often condense when they come in contact with colder parts of the instrument which results in hard layers of residue forming; this in turn can affect the operation and lifetime of the instrument itself.

To specifically address this challenge, Milestone has developed the PYRO XL which is faster, cleaner and more energy-efficient than conventional ashing systems.

The PYRO XL allows the analyst to process multiple crucibles, containing a combined total of up to 100 grams of sample, simultaneously.

PYRO XL advantages

- » Large sample amounts
- » Fast
- » Easy to use
- » High throughput
- » Cost effective

Pyro XL technical features

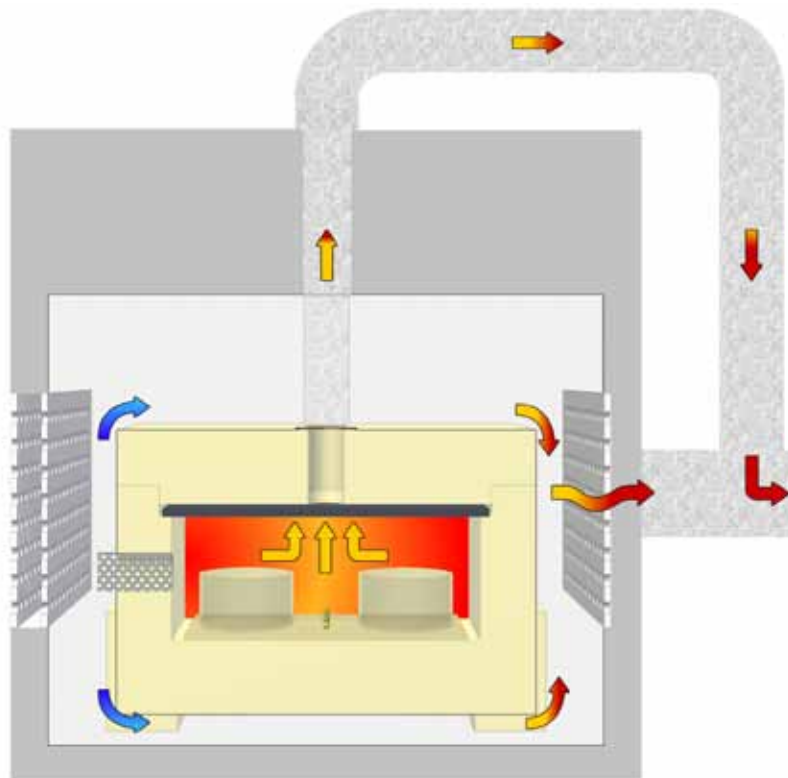
How the PYRO XL works

Hardware

The PYRO XL is constructed using solid stainless steel and built specifically for the laboratory environment. The chassis door, also constructed of stainless steel, has a ceramic fiber lining and is fitted with four micro-switches to automatically shut off microwave energy should the chassis door be opened.

An industrial grade magnetron can deliver up to 1200 watt of power but is precisely regulated to apply only enough energy to follow the method specified by the operator.

Located in front of the magnetron, a rotating stirrer ensures equal energy distribution inside of the cavity to maintain temperatures to ± 5 °C.



PYRO XL schematics

Inside the muffle furnace

A special microwave-transparent ceramic muffle allows microwave radiations to pass through and rapidly raise the temperature of a high-absorber material plate, located in the upper part of the cavity.

Sample crucibles are placed on a large clean quartz plate and an airflow is generated by a built-in exhaust system. Porous ceramic honeycomb frits built into the wall and the ceiling of the muffle furnace allow a constant stream of air to pass over the sample crucibles.

A large quartz tube located above the muffle conveys gases and vapors generated by the ashing process to the exhaust pipe, while the outer airflow maintains relatively cold the external temperature of the muffle.

Temperature is controlled via a high-precision sensor located in close proximity to the bottom of the ashing crucibles.

The sensor signal is used as a feedback control mechanism to regulate microwave power output and to maintain the user selected temperature.

PYRO XL *technical features*



User interface

The PYRO XL is operated using a stand-alone, color, touchscreen controller.

Running Milestone's EasyCONTROL software, it provides the operator with a simple yet effective interface and has real-time monitoring and feedback of all microwave processes.

It also allows the operator to store a number of microwave methods which can easily be recalled for future ashing process.

This ensure uniformity of process regardless of who the operator is.

All process parameters can be saved and exported using a Flash Card or USB stick.

Using Milestone's EasyDOC software, all process data can be converted into standard database of spreadsheets formats like Excel.



Rapid heating

The PYRO XL's ability to ramp from room temperature to 800 degrees in approximately 30 minutes eliminates the need to keep the system on continually.

Reduce your laboratory's energy consumption by simply turning the PYRO XL on when an ashing test is required.

Large muffle cavity for high throughput

The PYRO XL has a large muffle cavity which can accommodate several crucibles simultaneously.

Crucibles

The high-efficiency coupling features of the silicon carbide plate allows for the use of virtually any type of crucible including platinum, nickel, porcelain, quartz and quartz fiber.

Comfortable working conditions

The ceramic muffle is an excellent insulator which minimizes diffusion of heat to the surrounding laboratory areas.

Organic samples have been known to generate odors.

The PYRO XL's built-in exhaust system removes fumes from the interior and direct an exhaust hose to a fume hood or other outlet.

PYRO XL *microwave ashing system*



Unique applications possibilities

Previous microwave ashing systems can typically process a total of up to 10 grams of organic sample. The PYRO XL far exceeds this limitation and allows the user to process over 100 grams of sample per run. Some examples:

Sample	Sample amount	Number of samples	Reference Method	Ashing Temperature
Fuel Oil	Up to 25 grams	Up to 3	ASTM D482-95	775 °C
Crude Oil	Up to 15 grams	Up to 3	ASTM D482-95	775 °C
Polyethylene terephthalate	Up to 35 grams	Up to 3	ASTM D5630-94	900 °C
Polyethylene	Up to 35 grams	Up to 3	ASTM D5630-94	900 °C
Polypropylene	Up to 40 grams	Up to 3	ASTM D5630-94	900 °C
Wheat flour	Up to 15 grams	Up to 3	ISO 2171	900 °C

Official Methods Compliance

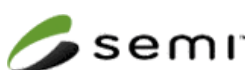
The PYRO XL meets the requirements of the following methods:



ASTM (American Society of Testing and Materials) Methods
 D5630-94 (Standard Test Method for Ash Content in Thermoplastics)
 D1506-99 (Standard Test Methods for Carbon Black-Ash Content)
 D482-95 (Standard Test Method for Ash from Petroleum Products)



U.S. Pharmacopeia Method USP 733 (Loss on Ignition)



SEMI (Semiconductor Equipment and Materials International)
 Method F48-0600 (Test Method for Determining Trace Metals in Polymer Material)



ISO 2171 (Cereals and milled cereal products – Determination of total ash)

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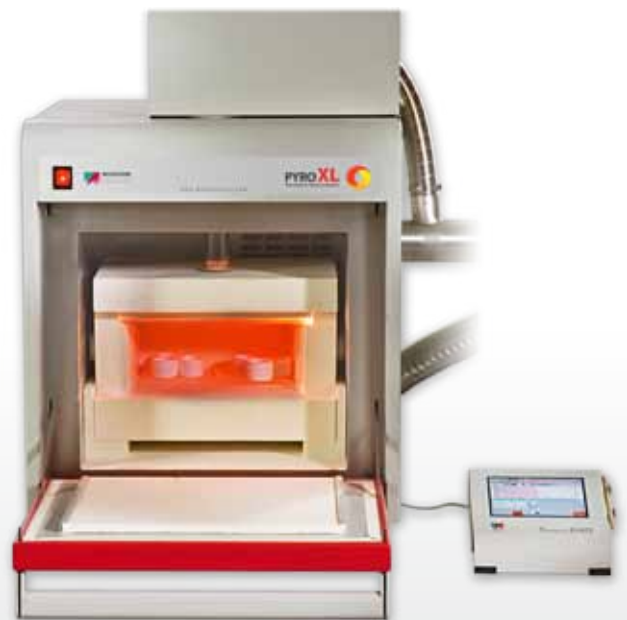
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