



MTW: Fully integrated and automated “glass” lab scale Vacuum & Microwave Dryer

For early-stage Microwave/Vacuum drying kinetic studies of API / NCE, scale-up and process validation



Accurate steepless microwave power control for realistic process research:
 * 30-300 Watt
 * Reflected power measurement

The Mini-Turbo-Wave offers you Maximised processing know-how with Minimised batch size

Pro-C-epT, by the creation of the R&D Mini-Turbo-Wave, succeeded with its many years know-how in microwave processing and equipment construction, to fulfil the need for a multipurpose small microwave processor. Your R&D staff has now the tool to experiment in Microwave Processing.

Microwaves have proven to be a very user friendly source for different kinds of energy transfer applications.

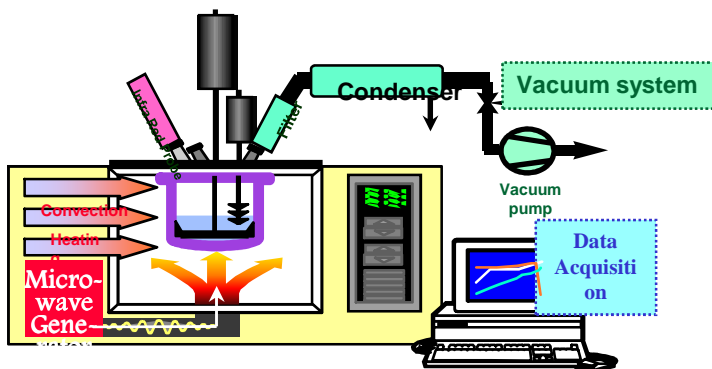
In microwave drying application you'll get: * short drying times * constant rate drying * uniform product quality * no sticking on the bowl jacket * low temperature processing * homogeneous drying * perfect control over energy input.

“Mini-Turbo-Wave” a Complete Flexible Multipurpose R&D Processor

- Processes can be simulated and controlled with same parameters as the real production scale. This leads to simple scale up rules, and accurate specifications for production equipment.
- The control system can be used for product and process optimisation combined with automation development.
- All process components can be disassembled quickly and are washable in a dishwasher even bearings and shaft seal assembly.
- The Mini-Turbo-Wave can be positioned in a hazard cabinet enabling processing of solvents and hazardous products.

Typical applications with Mini-Turbo-Wave

- * Drying Kinetics
- * Vacuum Drying
- * Vacuum Microwave Drying
- * Nutsche Filtration Drying
- * Gas Injection Drying
- * De-aeration
- * Melting
- * Extraction
- * Reaction
- + **YOUR PROCESS**



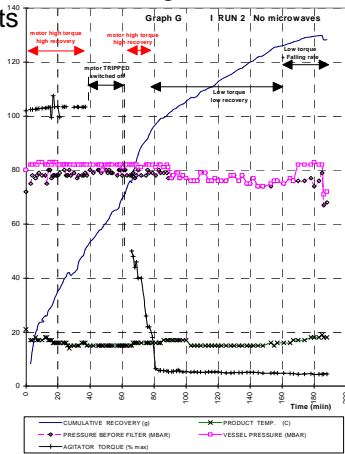
Large quantity of equipment options are available:

different mixing arms, choppers, scrapers, bowls, glass condensers, jacketed bowls, gas injection, vacuum control, homogeniser, infra red temperature measurement, recipe control

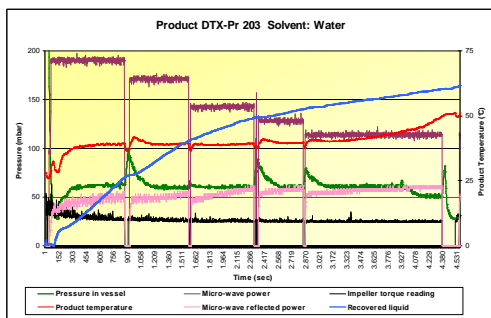
Mini-Turbo-Wave Automated Mini Microwave Vacuum Dryer

Smallest and most reliable one pot processor in the world

- * Ease-of-operation
- * Unique process view; whole process can be eye witnessed by the operator
- * User-friendly
- * Highly accurate scalability
- * Containment
- * Ease-of-cleaning and dismantling
- * Flexibility
- * Accurate & Repetitive end point detection for microwave drying, reflected power, solvent recovery, temperature and pressure are used for detection of the drying end point. The data can be extrapolated for use in bigger machines
- * Ease-of-qualification; e.g. to suit FDA/GMP/GAMP requirements

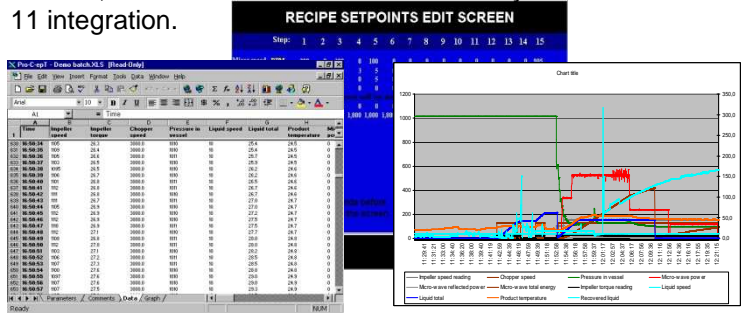


Relation torque and drying method



Completely Automated

User friendly controls and data on PC; real-time trends, complete batch report in excel, report manager and recipe handler, the electronic batch record is ready for 21 CFR Part 11 integration.

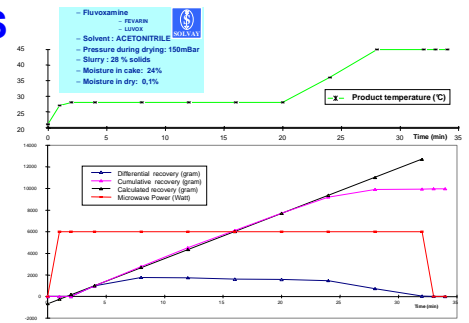
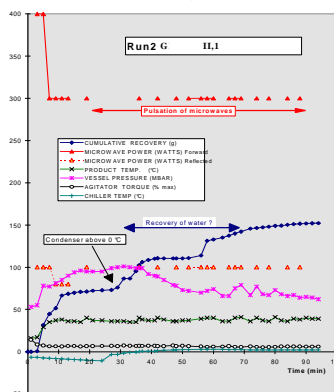


Advantages of Microwave Drying

- ◆ **Highly enhanced process performances:**
 - Drying cycle time reduction until factor 10 to 20
 - Easy scale-ability
- ◆ **Improved product quality:**
 - Uniformity of Drying
 - Free flowing end product
- ◆ **Improved process:**
 - Easy process validation
 - Moisture end-point detection
 - Automation - Validation
- ◆ **Drying of difficult products:**
 - Low temperature processes
 - Sticky and pasty- hydrates

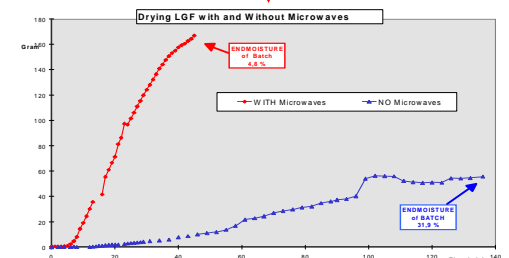
TYPICAL APPLICATIONS

Drying kinetics →



Constant rate microwave drying in Tro-N-Ut

Comparison from traditional drying with microwave drying



Heat and mass balances Reaction and reflux processes