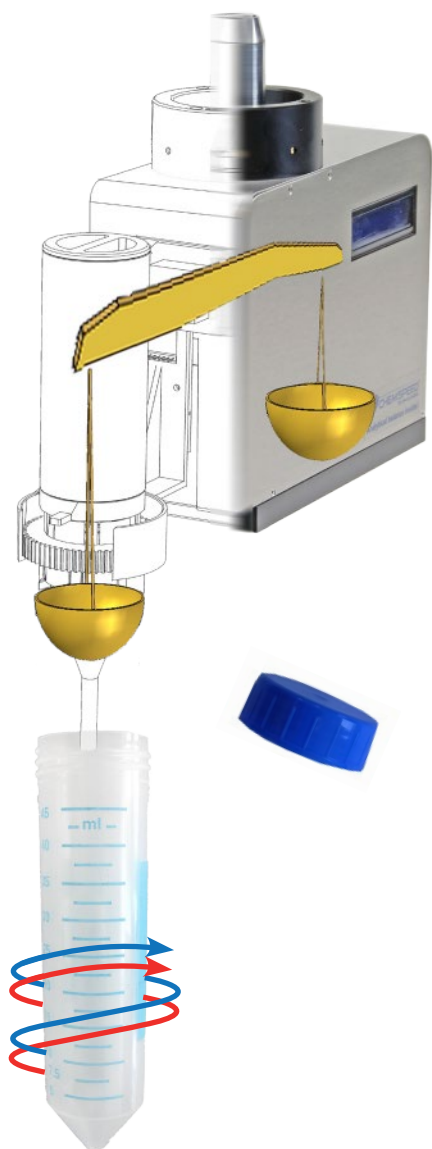


From Concepts to Success



SWING QuEChERS

Fully Automated & Integrated Food Testing

The **QuEChERS** Application

The **QuEChERS** Sample Preparation Workflow

Software & Workflow Templates

Platform Configuration for the **QuEChERS** Workflow

Robotic Tools & Deck Layout

Soft and Hardware Integration

Unattended Automation for Pesticide Residue Analysis

SWING QuEChERS

- high recoveries
- accurate reproducible results
- high sample throughput

- ready to use software templates, clear and simple solution
- lower reagent costs
- low solvent and glassware usage
- robust and rugged

The QuEChERS Application

Challenge the Food Testing

There are well over 1'000 targeted analytes of pesticides and their metabolites being monitored in food commodities at present. Laboratories are being asked to broaden their range and increase the quality of their pesticide analysis whilst management is demanding cost reductions.

The **QuEChERS** method is a streamlined approach that makes it easier and less expensive for analytical chemists to examine pesticide residues in food.

QuEChERS, standing for Quick, Easy, Cheap, Effective, Rugged, and Safe is readily accepted by both the Association of Analytical Communities (AOAC) and the Committee of European Normalization (CEN) for the analysis of pesticide residues in food and agricultural products.

QuEChERS is a simple and straightforward sample preparation technique for multi-residues screening.

Multi-residue methods increase sample throughput, decrease sample turnaround time, and optimize analyst efficiency. The QuEChERS method is a two-step process: extraction followed by clean up.

The QuEChERS Sample Preparation Workflow

The method includes a two-step procedure:

1. **Extraction workflow:** The purpose of this step is to extract pesticide residues into an organic solvent. A solid-liquid extraction with addition of salts to control pH and ionic concentration is performed.

2. **Clean-up workflow:** The purpose of this step is to remove matrix effects like polar pigments, organic acids, sugars and lipids from the sample by a sorbing material to increase the method's robustness.

Extraction workflow



Clean-up workflow

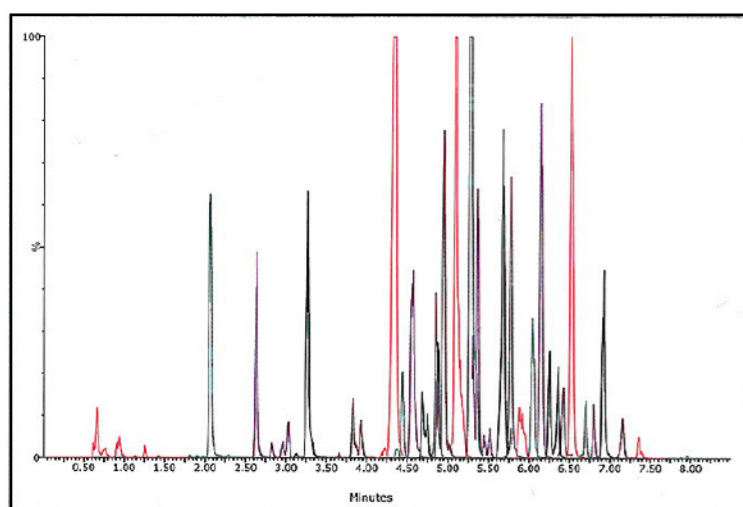


By introducing the **SWING QuEChERS** Chemspeed offers unattended automation for the complete **QuEChERS** workflow.

The platform can be configured in two different ways to reflect the analytical chemists' need.



SWING QuEChERS



Fast
Improved

Flexible
Cost-Effective



1. Throughput Optimized Configuration

- Up to 192 samples/ 8 h
- Sample preparation methods using kits (e.g. Waters, Agilent, Thermo)
- Preprogrammed testing templates



2. Cost Optimized Configuration

- Up to 96 samples/ 8 h
- Sample preparation methods using cost-effective disposable Falcon tubes and reagents purchased in bulk
- Preprogrammed testing templates

Software & Workflow Templates

AutoSuite SWING is an intuitive user interface software which allows easy programming of workflows. Many features such as the gravimetric dispensing steps are automatically calibrated, eliminating tedious optimization steps and user intervention.

- The *AutoTeaching* tool allows dispensing of powders, liquids, viscous liquids, and waxes without manual optimizing steps, and with high precision, accuracy and speed
- Easy programming: drag-and-drop workflow steps
- Barcode tracking
- Smooth integration into virtually any LIMS or ELN software
- AutoSuite Application Programming Interface (API) for 3rd party software and hardware integration

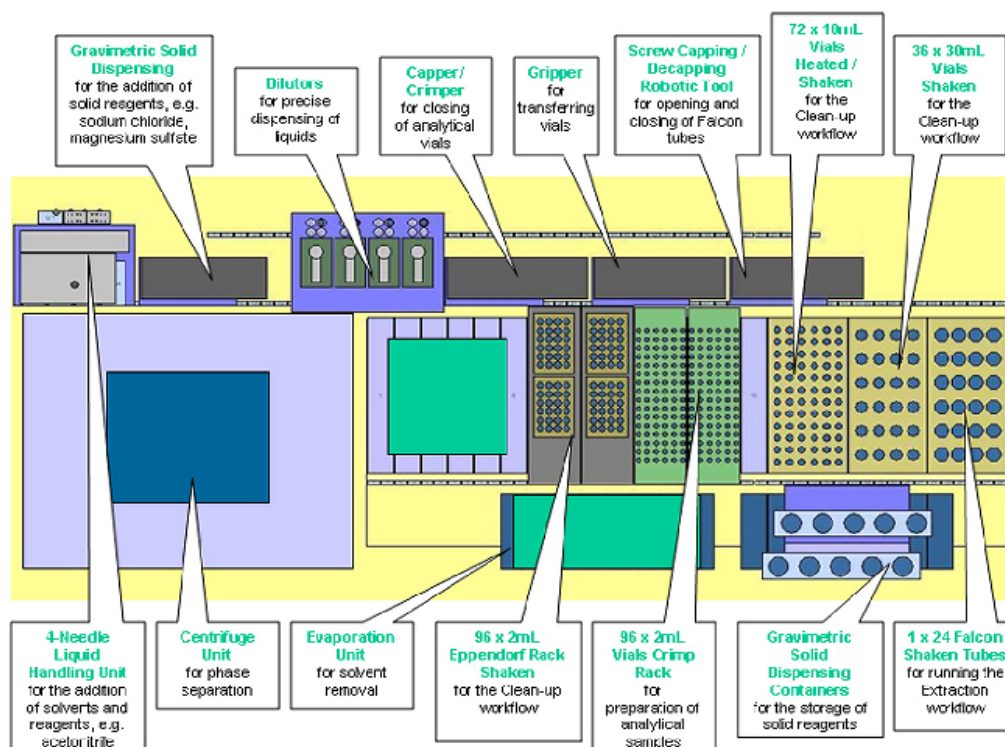
Exemplary Workflow Template

The screenshot displays the 'Application Editor' window for 'Quechers Workflow.app'. The interface includes a menu bar (File, Edit, Application, Tools, View, Help), a toolbar, and a main workspace divided into several sections:

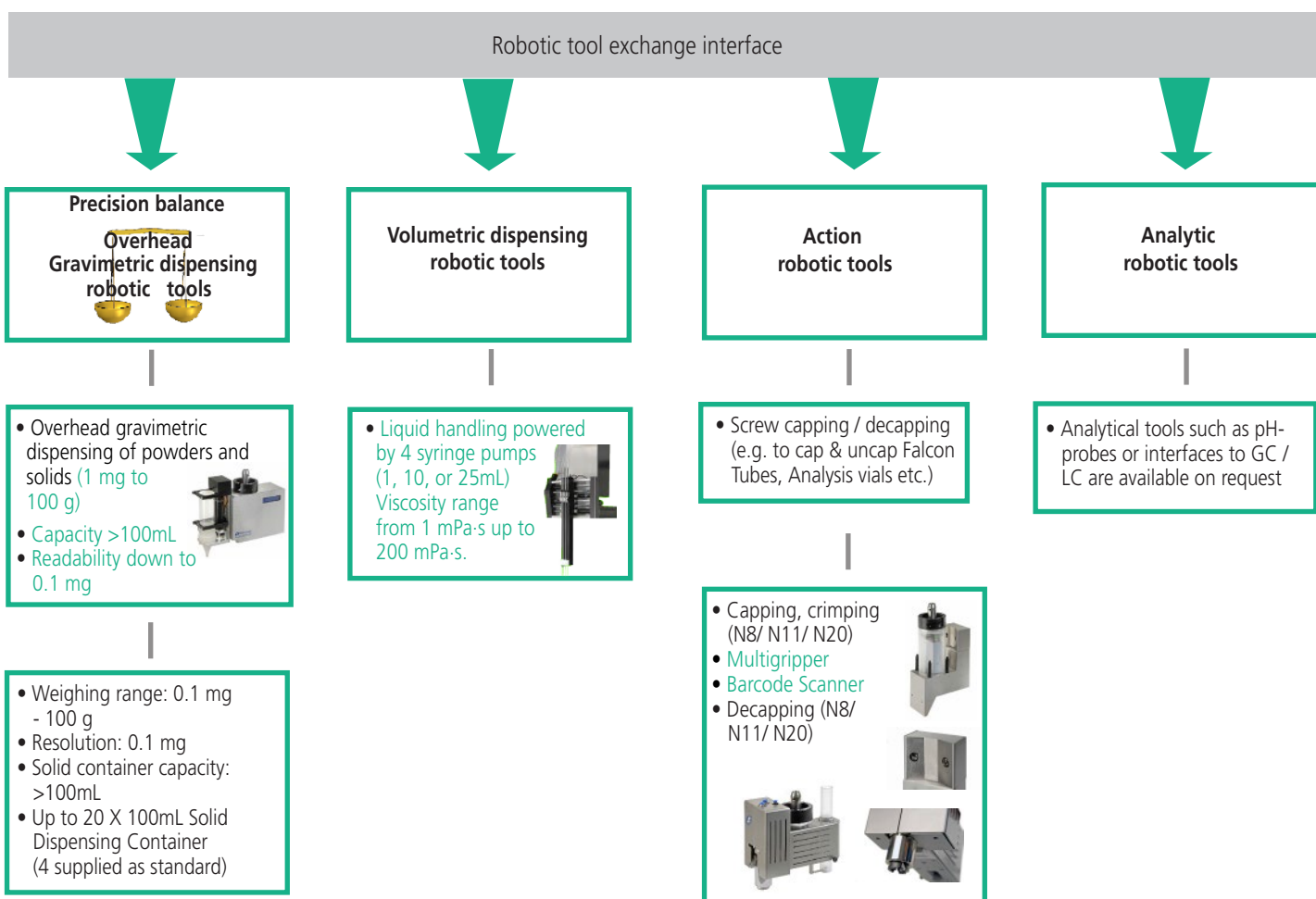
- Available Tasks:** A sidebar on the left containing various task icons categorized into 'General' (e.g., Play Sound, Show Dialog, Transport R/E Tool, Microwave, Transport, Decap, Cap / Crimp, Control Cryostat, Measure PH, Teach Solid Transfer, Transfer Gravimetrically, Transfer Volumetrically, Wait, Stir) and 'Advanced' (Useful Macros).
- Task List:** A central table listing tasks with their names and descriptions. The tasks are organized into numbered steps (1, 2, 3, 4) and include sub-tasks like 'Preparation of the samples', 'Sampling to 30 and 10 mL vials', and 'Evaporation and sampling in GC_LC vials'.
- Parameter and Description:** A table on the right providing details for each task, including parameters and a brief description.

Task	Name	Parameter	Description
1	Preparation of the samples	Macro Task	
1	Transfer Volumetrically		Transfer liquid from reagent 1 to 1st step with Needle Head #1
2	Stir		Agitation ON on zone 1st step
3	Wait		Waiting for 1:00 minutes
4	Stir		Agitation OFF on zone 1st step
5	Transfer Gravimetrically		Gravimetical Transfer with SDU #1 from reagent A to 1st step
6	Transfer Gravimetrically		Gravimetical Transfer with SDU #1 from reagent B to 1st step
7	open_close		Macro Task
8	Stir		Agitation ON on zone 1st step
9	Wait		Waiting for 1:00 minutes
10	Stir		Agitation OFF on zone 1st step
11	centrifugation step		Macro Task
12	open_close		Macro Task
	<insert sub tasks here>		
2	Sampling to 30 and 10 mL vials	Macro Task	
1	Transfer Volumetrically		Transfer liquid from 1st step to 2nd step large with Needle Head #1
2	Transfer Volumetrically		Transfer liquid from 1st step to 2nd step small with Needle Head #1
3	open_close		Macro Task
4	Stir		Agitation ON on zone 2nd step large
5	Stir		Agitation ON on zone 2nd step small
6	Wait		Waiting for 2:00 minutes
7	Stir		Agitation OFF on zone 2nd step large
8	Stir		Agitation OFF on zone 2nd step small
9	centrifugation step		Macro Task
10	centrifugation step		Macro Task
11	open_close		Macro Task
	<insert sub tasks here>		
3	Evaporation and sampling in GC_LC vials	Macro Task	
4	Evaporation and sampling in LC vials	Macro Task	
1	Transfer Volumetrically		Transfer liquid from 1st step to 2nd step large
2	evaporate under N2		Macro Task
3	Transfer Volumetrically		Transfer liquid from 1st step to 2nd step small
4	open_close		Macro Task
5	Stir		Agitation ON on zone 2nd step large
6	Wait		Waiting for 1:00 minutes
7	Stir		Agitation OFF on zone 2nd step large
8	open_close		Macro Task

Platform Configuration for the *QUECHERS* Workflow



Robotic Tools & Deck Layout



More than 40 robotic features are available for further platform upgrades

Robotic Tools & Deck Layout (continued)

SWING QUECHERS is Chemspeed's software-driven robotic platform for the analysis of pesticide residues.

- **SWING QUECHERS** brings paradigm shifting modularity enabling an easy to use workflow by a task driven software package.
- Exchangeable robotic tools
- Unrivaled gravimetric dispensing technology whilst shaking
- A large choice of hardware and software tools allow fine tuned adaptation to your workflow

Unrivaled Dispensing Technology, Exchangeable Robotic Tools, and **QUECHERS** Workflow

More than 40 tools can be integrated with Chemspeed's unique robotic tool exchange technology, including unrivaled overhead gravimetric dispensing tools which can operate whilst mixing, heating, refluxing and cooling. Sample preparation for multi residue analysis in food samples becomes more efficient and productive with Chemspeed's unique **SWING QUECHERS**.

Recommended optional Features

Optional configuration

High Shear Homogenizer

- Sample volume: 5-1'000mL
- Speed range: 11'000-30'000 rpm
- 4 cutter sizes
- Dedicated dynamic rinsing and drying station

Ultrasonic probe

Upgrade kit to SWEIGHER or SWAVE

- SWEIGHER: automated vial & plate weighing, filling, capping and crimping platform
- SWAVE: automated microwave assisted synthesis platform

pH- probe

Injection valve

More than 40 robotic features are available for further platform upgrades



Technical Details

Included Tools & Features

Robotic platform

- Robotics: X, Y and Z arm with rotating alpha-axis and automatic tool exchange
- Optional heating/ cooling, shaking
- Controlled atmosphere: inert gas, with optional glove box
- Trolley
- Dimensions R (l x d x h): 1480 x 910 x 1200 mm (4'4 3/8" x 3' x 3' 11 1/4")*
- Dimensions XL (l x d x h): 2350 x 950 x 1920 mm (7'8" x 3'2" x 6'4")*
- * Dimensions when hood is closed and exclude peripherals, electronic cabinet and connectors.

Centrifuge Sartorius-Sigma

- Speed range up to 15'000 rpm
- Suitable for low speeds
- Accuracy +/- 1 rpm
- Cooling capability
- Up to 28 Falcon tubes run in parallel



Robotic Tools & Deck Layout (continued)

Technical Details

Included Tools & Features

Rack for Sample Preparations (Falcon tubes)

- Rack for 32 Falcon tubes
- Shaking capability (up to 1'400 rpm)
- Heating/ cooling capability

Rack for Sample Preparations (30 mL vials)

- Rack for 36 x 30 mL vials
- Shaking capability

Rack for Sample Preparations (10 mL vials)

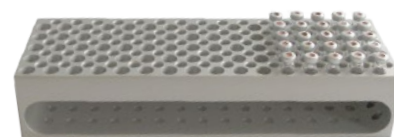
- Rack for 78 x 10 mL vials
- Shaking capability (up to 1'400 rpm)
- Heating/ cooling capability

Rack for Sample Preparations (2 mL GC/ LC vials)

- Rack for 96 x 2 mL vials (GC, LC)
- Shaking capability (up to 1'400 rpm)

Evaporation Unit

- Evaporation performed under N₂ flow



Soft and Hardware Integration

Third party instruments

Chemspeed integrates a vast number of 3rd party components (e.g. in robotic tools). Please refer to Chemspeed's Workflow Portfolio brochure and/ or contact your local Chemspeed representative.

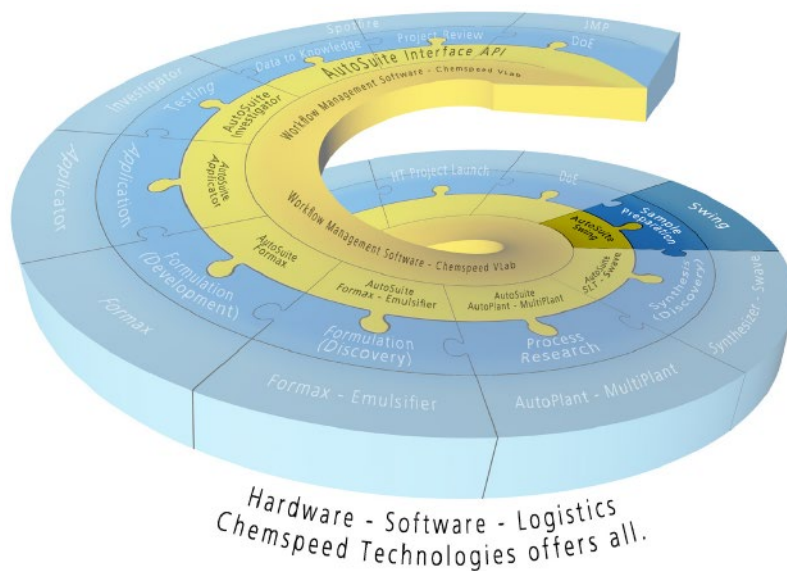
Third party software such as

- Integration into virtually any LIMS and ELN software

All tools and accessories of Chemspeed's Sweigher, Swave, Synthesizer SLT II, Formax, Applicator and Investigator are fully compatible with the **SWING QUECHERS** robotic platform and vice versa (see the high output product development spiral above). Please refer to Chemspeed's other workflow brochures for examples of modules.

Many upgrade options available:

- High performance reactor array technology
- Analytical interfaces
- Automated robotic features (more than 40)



High output product development spiral

Chemspeed's AutoSuite workflow management software integrates with all Chemspeed's robotic platforms:

- Sample preparation platforms
- Parallel array synthesis platforms
- Parallel process research platforms
- High output formulation platforms
- High output application platforms
- High output testing platforms