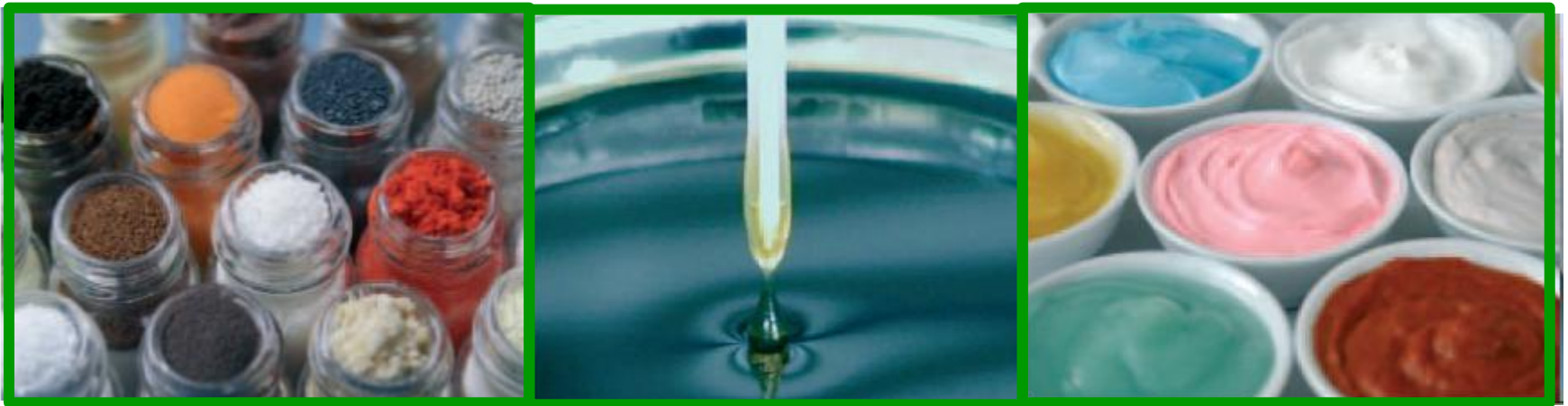


Automation for the Development of new Formulations



Industries requiring formulation R & D

- Pharmaceutical industry
- Cosmetic industry
- Health care products
- Personal care products
- Chemical industry
- Oil and lubricant industry
- Automotive industry
- Paints and coatings
- Food and beverage ...

What is required for formulation R & D?

- Ability to handle solid material
- Ability to handle standard liquids
- Ability to handle saturated solutions
- Ability to handle slurries
- Ability to handle viscous liquids/gels/creams
- True gravimetric dispensing
- Efficient mixing +/- temperature control
- Integrated analysis tools
- Positive feedback from analysis tools for formulation modification “on the fly”
- Intelligent software with in built scheduling for system control

Zinsser Analytic supply custom designed robotic workstations that offer modules for

- Powder handling for most powder forms
- Standard liquid handling
- Slurry handling
- Saturated solution handling
- Viscous media handling
- Mixing (vortexing, magnetic stirring, overhead stirring, shearing)
- Integrated analysis tools with feedback control
- Proprietary operating software WinLissy with integrated scheduling for optimum system efficiency

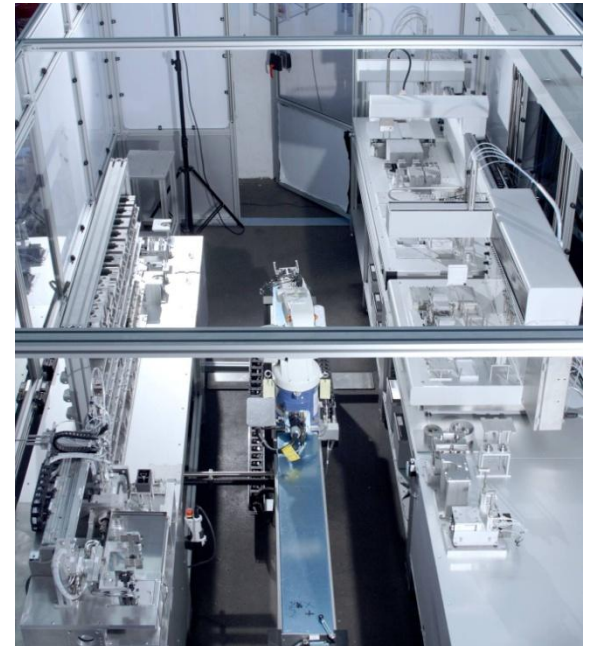
All supplied on one system!

The “Tools” Concept

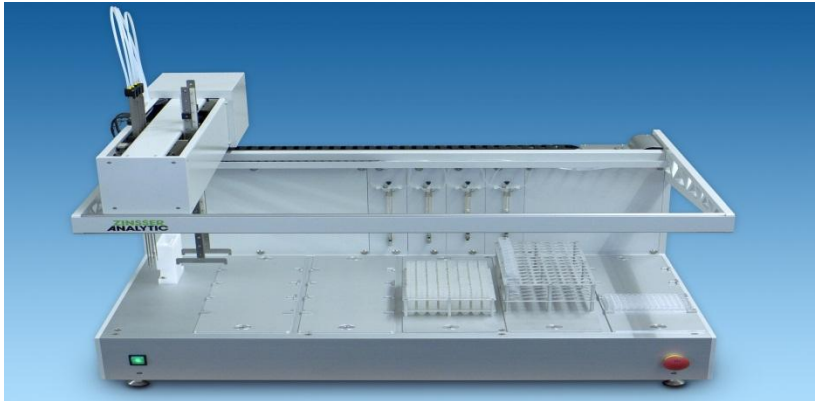
Robotic platform	X-Y-Z system, n-axes Robot
+ Tools	Liquid Handling, Mixing, ... Analysis...
+ Software	Controls, Communication

= Automatic Workstation

Delivers the custom tailored Solution



The Robotic Workstations



Medium Throughput Platform

- 90, 120, 200, 250 cm length
- 1 pr 2 arms for pipetting and gripping
- Up to 2 x 4 probes
- Independent, equidistant spacing (9 to 38 mm)



High Throughput Platform

- 100, 150, 200, 300 cm length
- Up to 2 arms
 - 2 pipetting arms
 - 2 gripping arms
 - 1 pipetting and 1 gripper arm
- 270° rotating gripper
- Up to 2 x 8 probes
- Flexible independent spacing

Solid Handling

Challenges of powder handling

■ Different characteristics:

- Particle size
- Particle size distribution
- Density
- Static Charge
- Hygroscopy

■ Various solids:

- ✱ APIs
- ✱ Resins
- ✱ Beads
- ✱ Lactose
- ✱ Aerosil
- ✱ Crystals, Salts
- ✱ Seeds
- ✱ Ground tobacco
- ✱ Extrudates

The REDI Powder Dispenser



- Powder tip aspirates powder
- Disposable tip
- Surface sensing

REDI Powder Handling Precision & Accuracy



	Dispense	mg
	1	1,24
	2	1,16
	3	1,13
	4	1,21
	5	1,22
	6	1,21
	7	1,18
	8	1,17
	9	1,24
	10	1,14
Average		1,19
Std. Deviation		0,04
CV [%]		3,34

Fine lactose powder

Redi Super Precision & Accuracy



Solid	Amount (mg)	SD	CV(%)
Gum Arabic	100	0.45	0.46
Gum Arabic	9,000	0.39	0.004
Kaolin	100	0.80	0.81
Kaolin	9,000	1.61	0.018
Talcum	100	1.34	1.35
Talcum	9,000	1.75	0.019
Starch	100	0.68	0.69

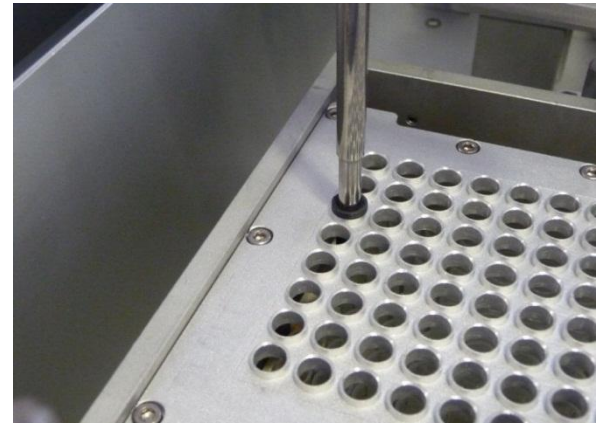
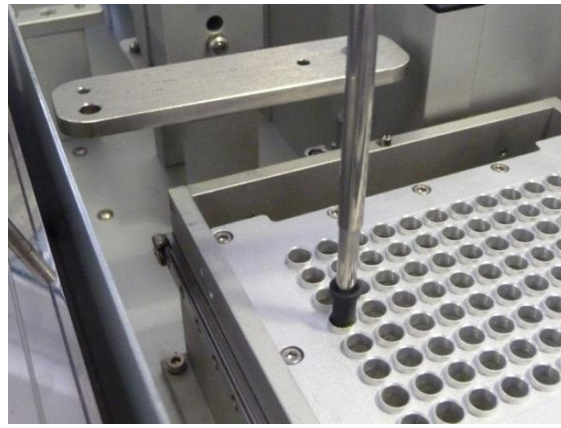
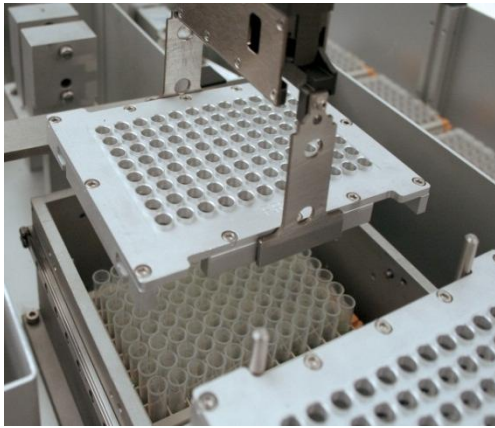
■ Vibration feeding of powders

Surface detection by Sensor



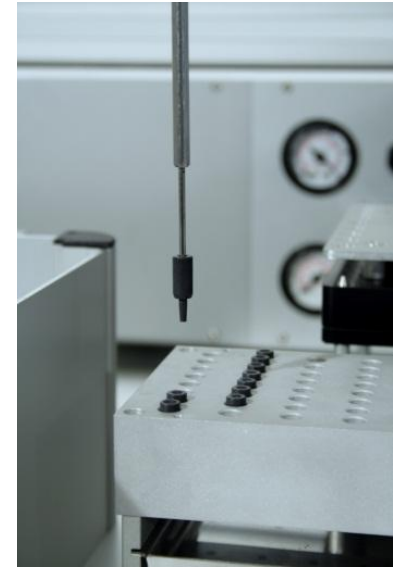
- Sensor scans surface of all powder samples to detect sample height
- Determined heights are stored in the database
- Powder tool travels down to predetermined height for aspiration

Positive Displacement Dispensing



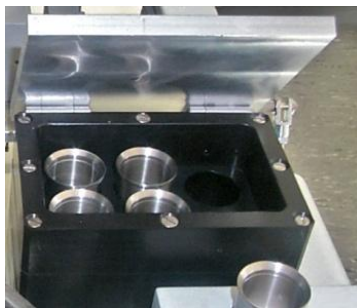
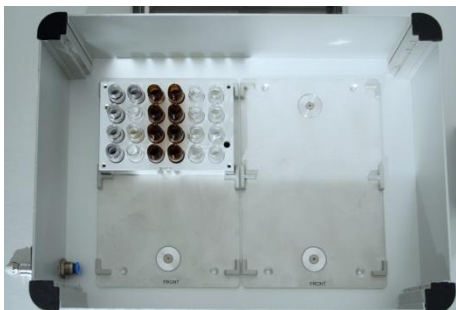
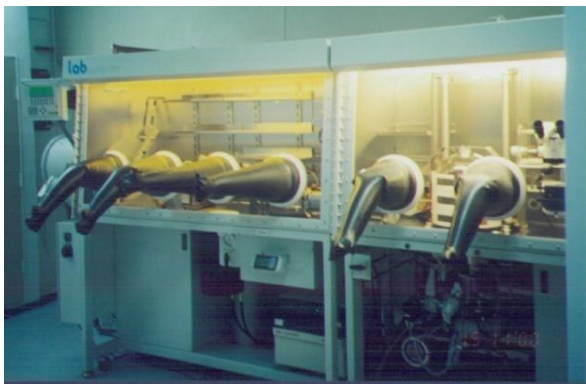
- Guiding plate is placed on top of the receiving vials
- The tip adapter pushes down inside the tip to push out the powder
- Good solution for sticky & static charged powders

Elimination Of Static Charge



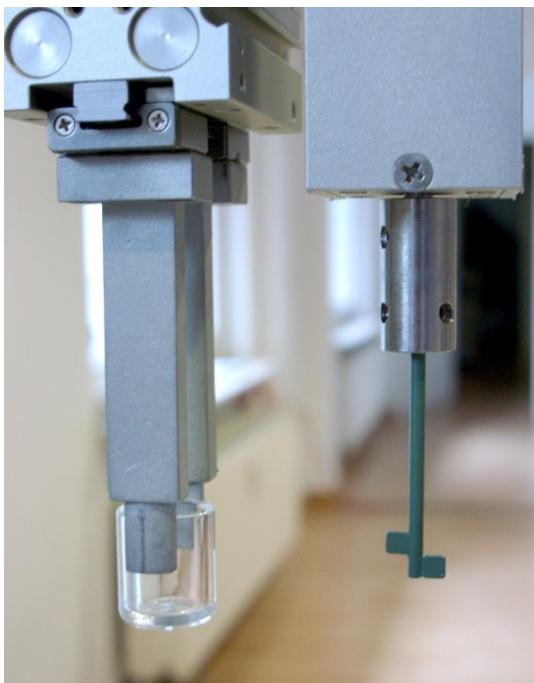
- Excellent grounding (set to the same potential)
- Modules supplying deionised air
- Use of conductive tips

Handling Hygroscopic Powders



- Nitrogen/argon flooded cabinet, or
- Localised areas of the workstation under inert conditions (source samples, destination labware)
- Lids for powder (nitrogen/argon flooded) containers
- Decapping powder container for dispensing

Mixing of powders



- Motor driven stirrer
- Mounted on the z-drive or as a pick up tool
- Designated solvent wash and vacuum dry station
- Shakers also available

Standard Liquid Handling

Standard Liquid Handling



- Each Z-drive can have its own individual probe
- A combination makes special applications possible (piercing, filtration, sampling, spraying, powder handling) in a single run
- Each probe can pipette a different volume
- Stainless steel probes, ceramic probes, disposable tips
- Single and multi-channel probes

Special Pumps for specific Needs



- Volumes from 1µl to 100ml
- Syringe pumps
- Rotary piston pumps
- Peristaltic pumps
- Membran pumps
- Pressurized delivery

Liquid Handling Challenges

Slurry Dispensing



- Wide opening slurry probe for fast delivery and to prevent clogging

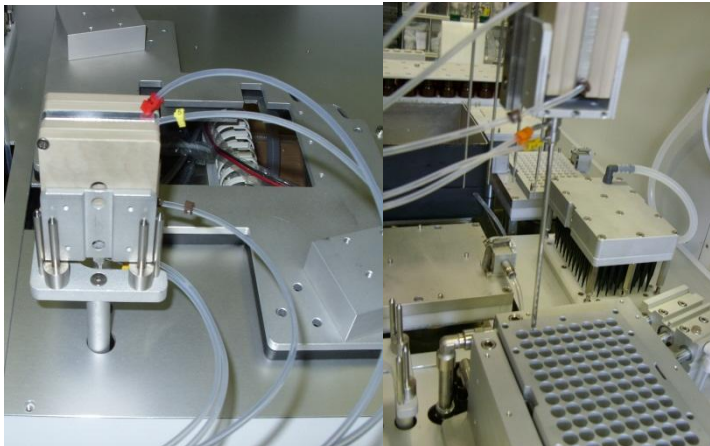
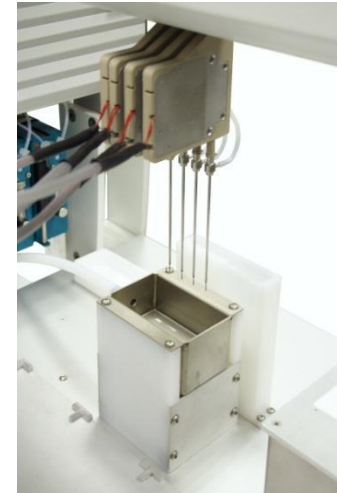


- Ceramic probe for aggressive media, slurries and ion free dispensing

Heated Probes for Saturated Solutions

Heated Probe

- Heated reservoir on top of the probe
- Electrical heating RT up to 80°C
- Mounted on z rack



Heated Probe Plus

- Heated reservoir and heated probe
- Heated by recirculating chiller RT up to 80°C
- Picked up and positioned by the gripper

Handling Viscous Liquids

Less Viscous – Pump Technology

- Software-controlled precision pumps
- Chemically resistant
- For bulk delivery

Highly Viscous – Positive Displacement Technology

- Positive displacement technology
- Disposable tips
- For precise pipetting
- Ultra sonic sensor for source height determination



Bulk Dispensing of Creams



- Pressurised cartridge based technology
- Dispensing achieved by fast acting pinch valve on outlet tubing & nozzle
- Dispensing occurs directly on a balance cell
- Tubing can be cleaned/sterilised between runs
- Robust design



Weighing

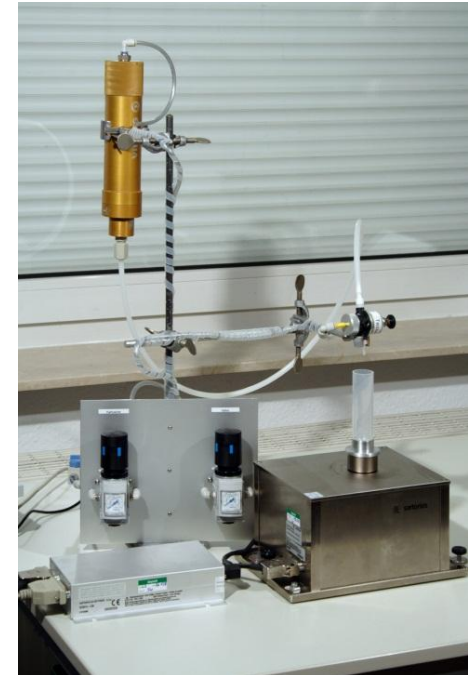


- Special designed integrated balance cell
- 4, 5 or 6 digit balance cell
- Deionisation device to remove static charge
- Gravimetric dispensing to set target weight (software controlled)

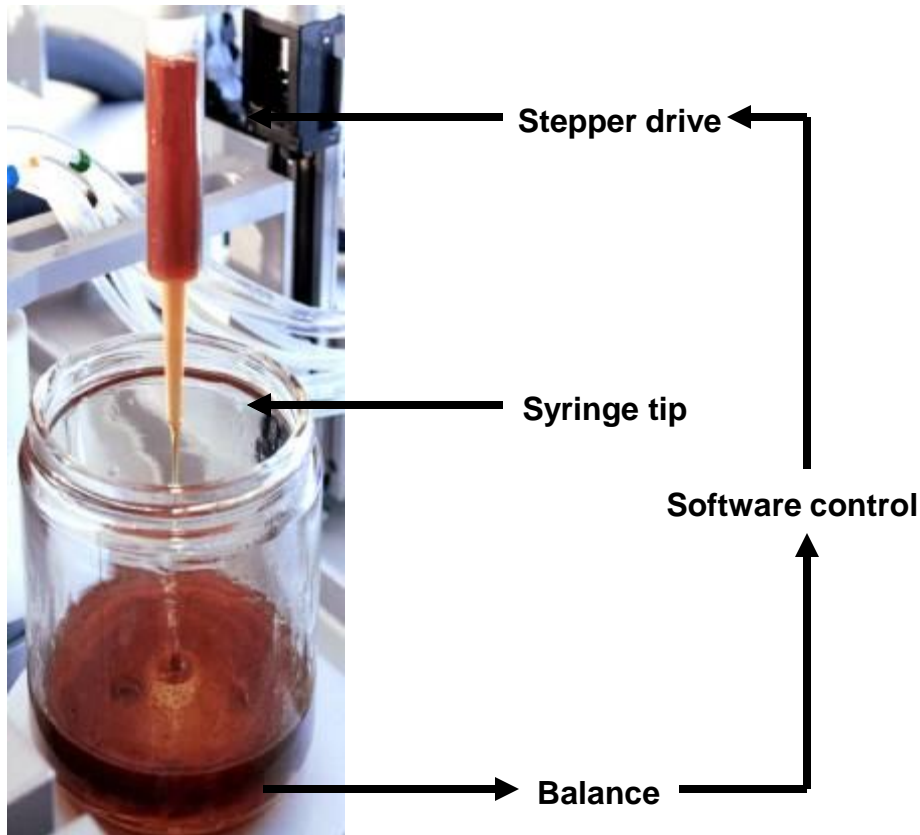
Bulk Dispensing of Highly Viscous Media

Product	Amount (mg)	Precision (%)	Time (s)
Skin Cream	14890.20	0.99	35
Skin Cream	14887.44	0.99	35
Skin Cream	14868.49	0.99	36
Skin Cream	14930.21	1.00	57
Skin Cream	14936.37	1.00	35
Skin Cream	14850.79	0.99	36
Skin Cream	14887.69	0.99	35
Skin Cream	14981.65	1.00	38
Skin Cream	14886.40	0.99	39
Average	14902.14	0.99	38.44
SD	40.10	0.00	7.11

- Pressurised cartridge based technology
- Outstanding precision and accuracy
- Fast operation



Precise Dispensing Of Highly Viscous Media



- Positive displacement technology
- Source heights determined from ultrasonic sensor
- Calculation of dispensing parameters
- Adjustment of parameters according to flow properties
- Calculating steps (volume), speed
- Control of dripping

Real Data from Viscous Dispensing

Stock-No.	Temp	Approach	Name	Estimated Viscosity, cSt	Density
1	Room	VISC	SDS	<50	0,79
2	80	VISC	DCD	300	0,94
3	Room	VISC	DEE	200	0,90
4	50	VISC	EEE	800	0,96
5	Room	VISC	BFE	300	0,95
5	Room	VISC	KLE	<50	1,20
6	Room	VISC	MNU	<50	0,96
7	80	VISC	AAA	2000	0,82
8	Room	VISC	BBB	10	0,80
9	50	VISC	CCC	500	0,90
10	80	VISC	CDD	1500	0,88
11	50	VISC	DCC	3000	0,93
12	Room	Pump	ABC	100	0,84
13	80	VISC	ABD	100	0,81

Blend No	Stock-No.	Target Weight	Actual Weight	Accuracy		Blend No	Stock-No.	Target Weight	Actual Weight	Accuracy
5	1089,5	1250	1251,11	100,1		17	1089,5	1250	1268,21	101,5
5	1358,5	250	252,49	101,0		17	1358,5	250	248,14	99,3
5	1422	500	500,20	100,0		17	1422	500	505,35	101,1
5	1902	625	635,03	101,6		17	1902	625	629,63	100,7
5	3058	75	77,12	102,8		17	3058	75	76,53	102,0
5	3272	2375	2385,24	100,4		17	3272	2375	2380,96	100,3
5	3337	25	26,40	102,6		17	3337	25	25,45	101,8
5	3401	1250	1259,98	100,8		17	3401	1250	1261,64	100,9
5	6195	50000	50128,27	100,3		17	6195	50000	50278,43	100,6
5	6360	17500	17639,07	100,8		17	6360	17500	17584,30	100,5
5	6361	18575	18597,91	100,1		17	6361	18575	18720,45	100,8

- Outstanding reproducibility over multiple runs
- Far better than manual processing

Mixing

Thorough Mixing



- Individual or batch wise
- Magnetic Stirring, Vortexing, Overhead Stirring, Shear Stress Mixing
- Overhead rotating mixers
- Inert blanket
- Software-controlled
- Temperature-controlled (up to 250°C)

Integrated Analysis Tools

Real Time Modulation

- Measure kinetic or dynamic viscosity, colorimetric analysis, LC/M-analysis, density etc. of samples during a run
- Positive feedback to operating software for viscosity adjustment during a run



pH Titration

- pH-determination with a pick up probe
- pH-adjustment software
- Acid & base addition with probe on magnetic stirrer
- Separate micro pumps for acid & base

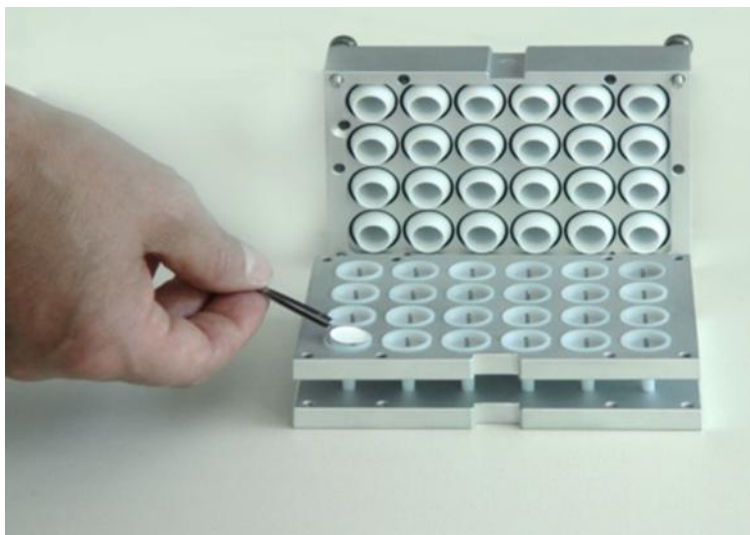


HPLC/MS Subsampling



- Special picking probe
- Time controlled sampling
- Cooling HPLC samples
- Capping HPLC vials
- HPLC & MS integration

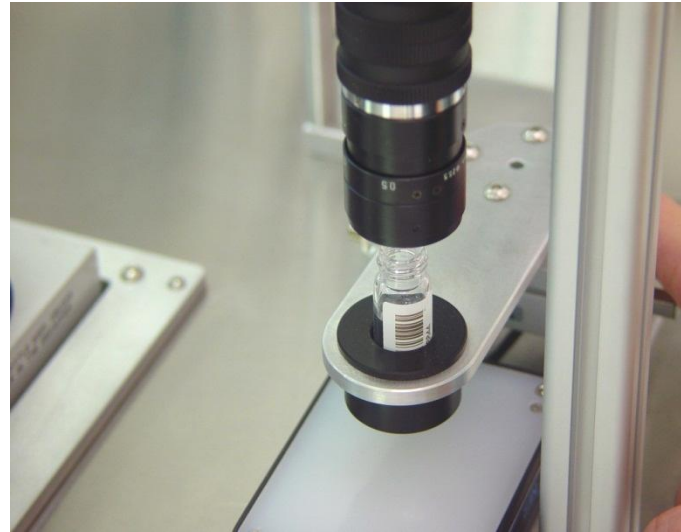
Controlled Filtration



- Pressure applied from the top
- With or without temperature control RT 90°C
- Controlled flow of filtrate
- Flow check
- Reproducible results
- Individual treatment of samples
- Recovery of solid residue



In Line Monitoring

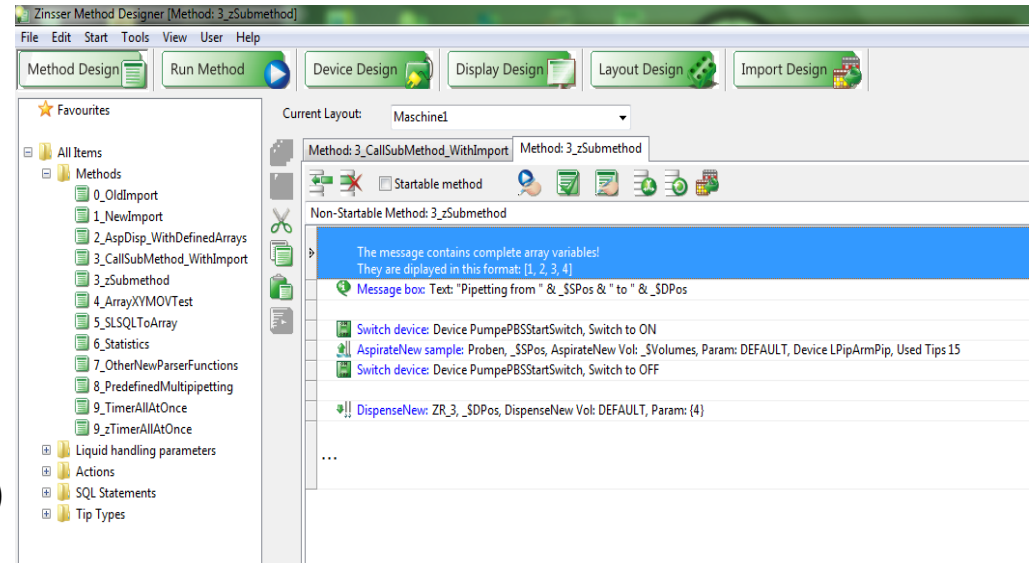


- Camera as pick-up tool
- Process monitoring
- Documentation and determination of solution status
- Check for crystal formation

Proprietary Software

WinLissy® Software

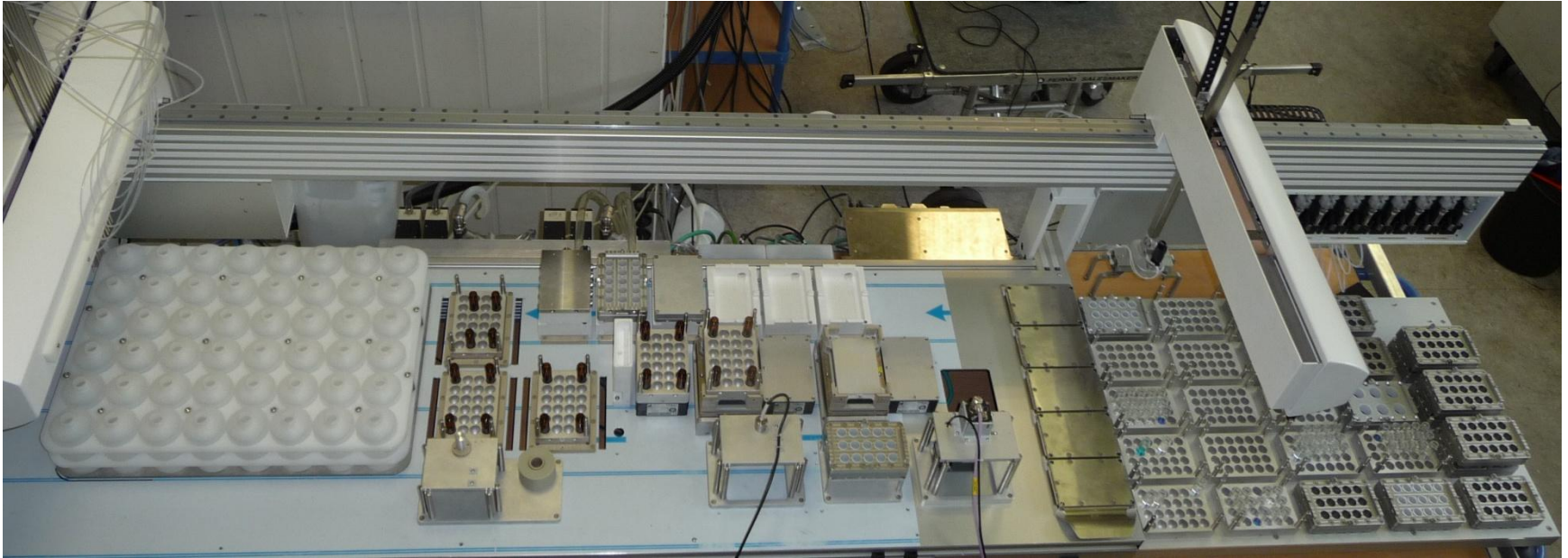
- Graphic user interface
- Easy to operate (Drag & Drop)
- Implemented Method Library
- Integral scheduling
- Access to all liquid & powder handling parameters
- Complete audit trail
- Download & upload of Excel® Files
- Communication with customer database or LIMS system
- No annual licence fee



DOE Import from Excel®

		Task	Parameter Name E1	Value E1	Unit E1	Parameter Name E2	Value E2	Unit E2	Parameter Name E3	Value E3	Unit E3	Formulation/Nr	Key ID	Run-plan	Processor-Type	Wafer name	zu dosierende Chemie 1	Chemie 1 Menge	RinsingMedium 1	RinsingMedium 2	Display
A1	Formulierung 1	Task 1 Dosing										Formulation 1	Formulation 1 - P000081 - A1	1on1	15er	Cu 1500 nm	BlueWater				1
		Task 2 Stirring	Speed	50	rpm							Formulation 1	Formulation 1 - P000081 - A1	1on1	15er	Cu 1500 nm					1
		Task 3 pH-Adjustment	Target value			Tolerance			Medium			Formulation 1	Formulation 1 - P000081 - A1	1on1	15er	Cu 1500 nm					1
		Task 4 Transfer	Amount	1	ml	Time	600	s				Formulation 1	Formulation 1 - P000081 - A1	1on1	15er	Cu 1500 nm					1
		Task 5 Heating	Heating On	1		Pre-Heating Temperature	24	°C	Heating Time	600	s	Formulation 1	Formulation 1 - P000081 - A1	1on1	15er	Cu 1500 nm					1
		Task 6 Shaking	Shaking On	1		Using Shaking Setup	1					Formulation 1	Formulation 1 - P000081 - A1	1on1	15er	Cu 1500 nm					1
		Task 7 Rinsing										Formulation 1	Formulation 1 - P000081 - A1	1on1	15er	Cu 1500 nm			DI-Wasser	Iso Propanol supra	1
		Task 8 Washing 1	Tank	2		Repeats	7					Formulation 1	Formulation 1 - P000081 - A1	1on1	15er	Cu 1500 nm					1
		Task 10 Washing 2	Tank	1		Repeats	1					Formulation 1	Formulation 1 - P000081 - A1	1on1	15er	Cu 1500 nm					1
		Task 11 Take Picture										Formulation 1	Formulation 1 - P000081 - A1	1on1	15er	Cu 1500 nm					1
		Task 12 Messung 1	Points	5								Formulation 1	Formulation 1 - P000081 - A1	1on1	15er	Cu 1500 nm					1
		Task 13 Messung 2										Formulation 1	Formulation 1 - P000081 - A1	1on1	15er	Cu 1500 nm					1
		Task 14 Messung 3										Formulation 1	Formulation 1 - P000081 - A1	1on1	15er	Cu 1500 nm					1
A2	Formulierung 1	Task 1 Dosing										Formulation 2	Formulation 2 - P000081 - A2	1on1	15er	Cu 1500 nm	Stammlösung 4%Zitronensäure 0,5% H2O2	4			1
		Task 2 Stirring	Speed	50	rpm							Formulation 2	Formulation 2 - P000081 - A2	1on1	15er	Cu 1500 nm					1
		Task 3 pH-Adjustment	Target value			Tolerance			Medium			Formulation 2	Formulation 2 - P000081 - A2	1on1	15er	Cu 1500 nm					1
		Task 4 Transfer	Amount	1	ml	Time	600	s				Formulation 2	Formulation 2 - P000081 - A2	1on1	15er	Cu 1500 nm					1
		Task 5 Heating	Heating On	1		Pre-Heating Temperature	24	°C	Heating Time	600	s	Formulation 2	Formulation 2 - P000081 - A2	1on1	15er	Cu 1500 nm					1
		Task 6 Shaking	Shaking On	1		Using Shaking Setup	1					Formulation 2	Formulation 2 - P000081 - A2	1on1	15er	Cu 1500 nm					1
		Task 7 Rinsing										Formulation 2	Formulation 2 - P000081 - A2	1on1	15er	Cu 1500 nm			DI-Wasser	Iso Propanol supra	1
		Task 8 Washing 1	Tank	2		Repeats	7					Formulation 2	Formulation 2 - P000081 - A2	1on1	15er	Cu 1500 nm					1
		Task 10 Washing 2	Tank	1		Repeats	1					Formulation 2	Formulation 2 - P000081 - A2	1on1	15er	Cu 1500 nm					1
		Task 11 Take Picture										Formulation 2	Formulation 2 - P000081 - A2	1on1	15er	Cu 1500 nm					1
		Task 12 Messung 1	Points	5								Formulation 2	Formulation 2 - P000081 - A2	1on1	15er	Cu 1500 nm					1
		Task 13 Messung 2										Formulation 2	Formulation 2 - P000081 - A2	1on1	15er	Cu 1500 nm					1
		Task 14 Messung 3										Formulation 2	Formulation 2 - P000081 - A2	1on1	15er	Cu 1500 nm					1
A3	Formulierung 1	Task 1 Dosing										Formulation 3	Formulation 3 - P000081 - A3	1on1	15er	Cu 1500 nm	Stammlösung 4%Zitronensäure 0,5% H2O2	4			1
		Task 2 Stirring	Speed	50	rpm							Formulation 3	Formulation 3 - P000081 - A3	1on1	15er	Cu 1500 nm					1
		Task 3 pH-Adjustment	Target value			Tolerance			Medium			Formulation 3	Formulation 3 - P000081 - A3	1on1	15er	Cu 1500 nm					1
		Task 4 Transfer	Amount	1	ml	Time	600	s				Formulation 3	Formulation 3 - P000081 - A3	1on1	15er	Cu 1500 nm					1
		Task 5 Heating	Heating On	1		Pre-Heating Temperature	24	°C	Heating Time	600	s	Formulation 3	Formulation 3 - P000081 - A3	1on1	15er	Cu 1500 nm					1
		Task 6 Shaking	Shaking On	1		Using Shaking Setup	1					Formulation 3	Formulation 3 - P000081 - A3	1on1	15er	Cu 1500 nm					1
		Task 7 Rinsing										Formulation 3	Formulation 3 - P000081 - A3	1on1	15er	Cu 1500 nm			DI-Wasser	Iso Propanol supra	1
		Task 8 Washing 1	Tank	2		Repeats	7					Formulation 3	Formulation 3 - P000081 - A3	1on1	15er	Cu 1500 nm					1
		Task 10 Washing 2	Tank	1		Repeats	1					Formulation 3	Formulation 3 - P000081 - A3	1on1	15er	Cu 1500 nm					1
		Task 11 Take Picture										Formulation 3	Formulation 3 - P000081 - A3	1on1	15er	Cu 1500 nm					1
		Task 12 Messung 1	Points	5								Formulation 3	Formulation 3 - P000081 - A3	1on1	15er	Cu 1500 nm					1
		Task 13 Messung 2										Formulation 3	Formulation 3 - P000081 - A3	1on1	15er	Cu 1500 nm					1
		Task 14 Messung 3										Formulation 3	Formulation 3 - P000081 - A3	1on1	15er	Cu 1500 nm					1

ZINSSER ANALYTIC Special Formulation System



- 3.0 m platform, 400 tests per day
- Formulation and testing coatings for wafers

Blending System



■ 2.5 m platform, up to 40 blends per run

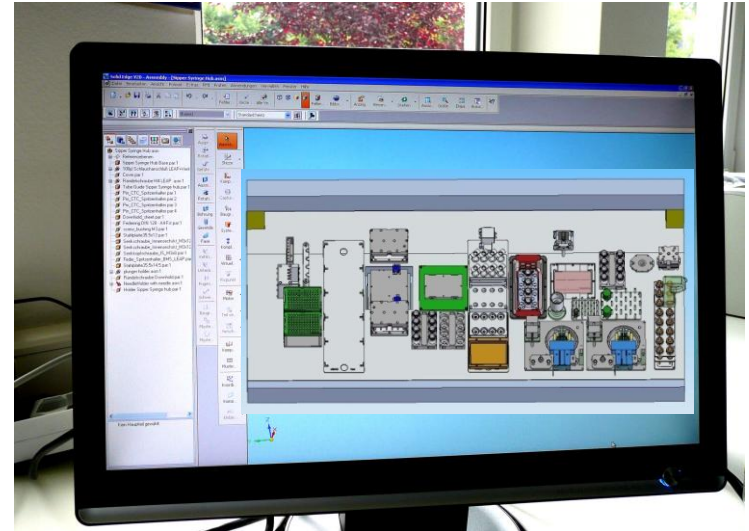
Project Management

Management of Customised Projects

- Understanding customer requirements
- In house hardware
- In house software
- Integral scheduling software
- Step by step discussions
- Project Management

are the benefits of working with Zinsser Analytic.

Project Management



- Development phase to define scope
- Meeting with engineers and programmers early on
- Real insight based on experiences
- Face to face meetings
- Monthly update meetings

Customers...

Abbott D, USA
 ABX, D
 Actelion, CH
 Agfa, B
 AKZO
 Amgen, USA
 ARKEMA, F
 AstraZeneca, GB, S, USA
 Avantium
 BASF, D
 Bayer-Schering, D
 Bayer Crop D, F
 Battelle USA
 Behring-Dade
 Biofocus, UK
 Boehringer Ingelheim D, USA
 BMS, USA
 BMW
 BP, UK, USA
 Bristol Meyers Squibb, USA
 Byk Gulden
 Celltech
 Centeon US
 CEREP, F
 Clariant, F
 Criterion-Shell, USA
 Diamond Light
 Damm E
 Degussa

DMS, NL
 DuPont
 Dow Chemicals
 Eli Lilly
 Eurofins, F
 Evotec-OAI
 Flamac, B
 Esteve E
 Eurofins, F
 Exxon USA
 Fering UK
 Ferrotron
 Fournier, F
 Ford Motor Company
 Galapagos, F
 GNF, USA
 Grifols; USA
 GSK GB, I, USA
 General Electric
 Genentech, USA
 Genencor
 Goodyear
 Grünenthal, D
 ICI, UK
 IFP, F
 Janssen
 Jerini Biotoools
 Klüber, D
 KRICT, ROK
 KRA, ROK
 Lanxess, D
 Lundbeck, DK
 Merck D

MERCK, US
 Merck-Serono, USA
 Michelin F
 Millenium
 MIP Technologies, S
 MLL, D
 Monsanto, USA
 Nestle CH
 Novartis CH, F, D, UK, China
 Novo Nordisk
 Nycomed, D
 Organon, NL
 Onyx, UK
 Pfizer, USA, GB, S
 Piramal, India
 Rhodia F
 Roche, D, CH, USA
 Sanofi D, F, USA
 Sanoif-Pasteuer, F
 Sartorius-Stedim
 Sintef
 Servier
 Siemens
 Siena Biotech
 Shell, NL
 SK Telecom, ROK
 Solvias, CH
 Solvay D
 Syngenta CH, GB
 Total, B
 UCB, B
 Ugichem, A
 UOP, USA
 Umicor, B
 Wyeth, USA
 Yamanouchi

Thank you for your attention!