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Processing food ingredients requires quality, safety, sustainability and economic feasibility.

Existing businesses are challenged by increasing complexity of product formulations and the push for longer run-times. At the same time investments in new equipment and staffing are not to be taken for granted.

New businesses have to find their way from lab innovation, through validation to full-scale plant production. Process design needs to be challenged, trial runs need to be done and from the learnings the process design can be completed. In other words, moving up in the Technological Readiness is a big challenge, *see figure 1**.

Understanding of the product – process interaction is key to finding the solution. This is where NIZO experts come in, together with the largest food grade pilot plant, accessible for 3rd parties. The NIZO processing experts work in close collaboration with NIZO experts in flavor/texture and microbiology/safety. Not to forget the strict quality conditions that apply for the incoming streams to our food grade pilot plant. The overview of unit operations in this sheet gives you the insight in our capabilities and scale of work. Especially the variability in finding the right process step in combination with the flexibility in available separation equipment contributing a great deal to speeding up to the desired output.

Last but not least, NIZO processing centre is capable of performing commercial productions for high value, low volume work. Our spray drying and fermentation capacity has been successfully applied by our customers in evaluating market readiness before going into full-scale production.

Interested to find out what we can do for you?
Just contact me by sending me an email.

Peter

TYPE OF PROCESS	PRODUCT/ PROCESS APPLICATIONS	TYPE OF PRODUCT/ PROCESS	EQUIPMENT	SCALE / CAPACITY	PACKAGING
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Product preparation	• Dairy applications	• Semi hard cheese types	• Cheesevats and whey drainage	• 100 L to 1500 L batch	• cups, small buckets, bag-in-box
		• Yoghurt and yoghurt drinks	• Fermentation vessels and tanks	• 20 L to 3000 L	
		• Ice cream	• Cherry Burrel scraped cold exchanger	• 80 L batch	
		• Aerated products (deserts)	• Mondomixer	• 70 L/h	
		• Pastes and processed cheese	• Stephan cutters	• 4 and 60 L batch	
		• Emulsions	• Limitech	• 125L batch	

	• Beverages	• E.g. smoothies and fruit juices	• tube and plate heat exchanger	• 50 to 500 L	• bottles (bring your own), bag-in-box
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Upstream processing	• Powder dissolving line • Homogenisation	• Wide range of powders	• Jongia unit	• >1000 kg/h	
			• Single stage - max 300 bar	• 100-350 L/h	
			• two stage - max 1500 bar	• 100-350 L/h	



Fermentation	• LBP (Live biotherapeutic products)	• Strictly anaerobic	• Fermentation line from UHT to pelletisation	• 600 L	
	• (mixed) Starter culture optimisation	• Anaerobic	• fermentation tanks	• 25, 600 and 4000 L	
	• Probiotics	• Aerobic	• Fermentation tanks	• 25 and 600 L	



Heat treatment / Processing	• (thin) Liquid products	• Plate heat exchanger, tube heat exchanger, direct steam injection and flashing	• Combitherm	• 125 L/h, holding time 5s-5 min	
			• Plate heat exchangers	• 600-1200 L/h, 2000-5000L/h, 10.000 L/h	
			• Tube heat exchanger	• 2000-5000 L/h	



Separation	• Separation	• Bacteria removal	• Bactofuge	• 600 L/h and 4000-10.000 L/h	
		• Solid/Liquid	• Decanter (coming soon)	• 1000-3000 L/h	
		• Liquid/Liquid	• Centrifuge	• 10 L/h, 60 L/h, 600 L/h, 4000-10.000 L/h	
	• Membrane filtration	• Microfiltration	• Ceramic (1 and 2 stage)	• 0,4 - 10 m2	
			• Hollow fibre	• 1,4 m2	
		• Ultrafiltration	• Spiral wound (1, 2 and 3 stage)	• 1-175 m2	
			• Hollow fibre	• 6 m2, 4 m2, 2 m2	
		• Nanofiltration	• Spiral wound (1 and 2 stage)	• 1 and 24 m2 (tbc)	
	• Reversed osmosis	• Spiral wound (1 and 2 stage)	• 1 and 24 m2 (tbc)		
	• Chromotography		• Ion exchange columns	• 350 L	
• Evaporation	• Falling film	• 4-stage	• 300 L/h and 2000-5000 L/h		



Drying	• Spray drying	• Bench top	• Glatt agglomerator • Büchi lab dryer	• 1-5 kg • max. 100g batch	
		• Single stage, rotary or nozzle	• NIRO-25	• 25 L water evap/h	• 20 kg bags
		• Multi stage, high pressure nozzle(s)	• NIRO-250	• 250 L water evap/h	• 20 kg bags, bigbags
	• Drum drying	• Double drum (vacuum)	• Andritz prototype	• 45 L water evap/h	• 20 kg bags
	• Freeze drying	• Bench top (not food great)		• 1,2 kg batch size/ 100-500 g powder	

TRL-INDEX-TECHNOLOGICAL READINESS LEVEL



- TRL 1: **Basic principles** observed and reported
- TRL 2: **Technology concept** and/or application formulated
- TRL 3: Analytical and experimental critical function and/or characteristic **proof of concept**.
- TRL 4: Technology **validated** in **lab** environment



- TRL 5 : Technology **validated** in **relevant** environment
- TRL 6: Technology **demonstrated** in a **relevant** environment
- TRL 7: System prototype demonstration in **operational** environment
- TRL 8: System completed and **qualified** through test and demonstration

- TRL 9: Actual system **proven** in operational environment

**INNOVATING
TOGETHER**

NIZO
FOR BETTER FOOD & HEALTH

* figure 1

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