Modelling in food process engineering

MC linked to equipment design and process control is a crucial element of the Industry 4.0 movement. MC intends to gain a high-resolution insight on the propagation of parameters in a material and over the process time. We study aspects of fluid mechanics, heat and mass transfer.

Our projects focus on: (i) the influence of tube geometries in heat exchangers on properties of whey proteins used in additive-free yogourt (TurbuHeat); (ii) manufacturing appealing meat substitutes with in-house developed cooling dies attached to twin screw extruders (myXprot) or (iii) reducing drastically flavor profile perturbations by an optimized thermal processing (FlavorRet). Sometimes, new process analytical technologies (PAT), such as in-line viscosity measurements in extrusion, enable a rapid, resource saving tuning of the process.
Objectives

- Valorization of whey proteins by tuning protein properties
- Improving the texture of meat substitutes made with pea proteins
- Reducing the flavor profile perturbation during thermal preservation

Results & Deliverables

- Precise control of techno-functional properties of whey aggregates
- Design of high performance geometries of twisted tubes used in heat exchangers for high viscous fluids
- Construction of next generation static and dynamic extruder dies for the fibration of plant proteins
- Installation and predictive model for the quantification of flavor transport phenomena

Field of research
- Food process and systems engineering

Duration of study
- 2014-2018

Research groups
- Institute of Life Technologies (HES-SO Valais/Wallis)
- Institute of Systems Engineering (HES-SO Valais/Wallis)
- Applied Microengineering Institute (He-Arc)

Direction
- Prof. Dr.-Ing. Michael Beyrer

Research team
- Fernanda Kerche Paes da Silva
- Martijn Weterings
- Dr. Jean Decaix
- Prof. Laurent Rapillard
- Prof. Alexandra Homsy

Partners
- SPE Tech AG (Frauenkappelen, CH)
- Firmenich SA (Geneva, CH)
- Clestral SA (Firminy, F)
- Hochdorf Swiss Nutrition AG (Hochdorf, CH)

Publications
- Weterings, M., Beyrer, M., Models with helical symmetry studied in a 2D plane, COMSOL Conference (2013), Rotterdam.