



Topics of Bachelor Thesis

Study Programme: Engineering – Energy Engineering and Process Technology, Scope to Process Technology

Academic Year: 2021/2022

| Supervisor | Topic |
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| Assoc. Prof. Ing. Karel Petera, Ph.D. | <p>Distribution of dissolved oxygen in fish tanks.</p> <p>This work aims at description and assessment of various operational and geometrical parameters affecting the distribution of dissolved oxygen in fish tanks. Part of this work will be an implementing of a simplified model in ANSYS Fluent imitating the oxygen consumption by the fish. Fish production is an important part of the food industry and optimal parameters can contribute to higher efficiency. CFD is a necessary tool in the design of many industrial equipment and determination of optimal operational parameters.</p> |
| Assoc. prof. Ing. Jan Skočilas, Ph.D. | <p>Rheology of viscoelastic material.</p> <p>The identification of flow properties of investigated material, especially when the material exhibits Non-Newtonian behavior, which is usual for food, is preceding key step in design of the equipment determined for material transport, e.g. in pipes. The aim of the work is assessment of the viscoelastic properties of the collagen matter in the capillary rheometer. The assessment of viscoelastic parameters of collagen matter will be performed by observation of the phenomena "Die swell" known also as "Extrudate swell" or "Barus effect". This effect is manifested by swelling of the outer dimension of the product compare to dimension of the capillary die. Based on the image analysis of dimensions of the product in the vicinity of die it is possible to determine swell ratio, from which the viscoelastic properties are possible to obtain.</p> |
| Assoc. prof. Ing. Jan Skočilas, Ph.D. | <p>Flow properties of melt reinforced polymers.</p> <p>Work deals with measurements of the flow properties of polymer melts. The experiments will take place on a laboratory extruder. The flow properties of various polymers will be determined, including polymers with additives such as glass or carbon beads and fibers. The melt flow index will be determined experimentally.</p> |
| Assoc. prof. Ing. Jan Skočilas, Ph.D. | <p>Design of Mining locomotive drive cooling.</p> <p>For the proposed parameters of the hybrid drive of a mining locomotive into a hazardous environment, design a suitable method of cooling the drive part - diesel unit, electric motor, generator, battery, exhaust pipe, etc.</p> |
| Assoc. prof. Ing. Lukáš Krátký, Ph.D. | <p>Process characteristics of laboratory bioreactor.</p> <p>Put the laboratory bioreactor into operation. Experimentally identify the process characteristics of the bioreactor (relationships between action and controlled variables, rise time to operating temperature, heat loss, power characteristics in given configurations). Validate the measured data using theoretical calculations of characteristic transmission phenomena.</p> |



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| <p>Ing. Jiří Moravec, Ph.D.</p> | <p>Measuring sensor for rheological properties of fluids. The up to date knowledge in the field of measuring rheological properties of fluids using impellers (literature search) should be used to design a measuring sensor which would enable to measure flow properties of different liquids/suspensions at desired temperature range easily and systematically. The sensor design should be compliant with a rheometer Rheotec RC20 which is used in the rheological laboratory of the department. Except the above-mentioned literature search, the work should contain complete design of the sensor in form of production drawings. The sensor should be produced (ensured by the supervisor) and its usability should be tested in several checking measurements using liquids of known viscosity.</p> |
| <p>Ing. Jiří Moravec, Ph.D.</p> | <p>Process characteristics of hydrodynamically optimized impellers. The aim of the work is to determine the basic process characteristics of two newly developed hydrodynamically optimized impellers, i.e. to determine their power, homogenization and suspension characteristics. The work is based on experimental measurements. The scope of work will be adjusted according to the time possibilities of the student. For management that can be put to work and specify parameters using CFD.</p> |
| <p>Ing. Jiří Moravec, Ph.D.</p> | <p>Effect of dynamics of liquid level change on power consumption of impeller in mixed vessel. The aim of the work is to describe changes in the power required for mixing of liquid in situations where the liquid is discharged from the device or filled into it, i.e. in a state where the liquid level moves around the stirrer. One of the factors whose influence is to be described is the speed of movement of the liquid level. The work should be primarily solved experimentally. It will be necessary to assemble the measuring device from the prepared components, perform measurements with various impellers, then evaluate the measured data and discuss the obtained results. Although it is a typical experimental work, the results of which provide recommendations for the practical operation of the device, its results can also be supported by numerical simulations. The specific scope of work will be adjusted by agreement.</p> |
| <p>Ing. Jiří Moravec, Ph.D.</p> | <p>Rheological properties of fluids. The aim of the work is to measure rheological properties of chosen fluids. The whole work will consist of description of methods and devices that can be used for measuring, selection of a suitable method and configuration of the device, carrying out necessary experiments, their evaluation and discussion of results.</p> |
| <p>Ing. Jiří Moravec, Ph.D.</p> | <p>Free topic. I offer the possibility of supervision of a diploma thesis with an own topic suggested by student. The work can be aimed on any topic from the field of process engineering (engineering or computational proposal of equipment, balancing of processes, experimental works, CFD and others). The final topic and scope of solution will be prepared after consultation with the student.</p> |
| <p>Ing. Jaromír Štancl, Ph.D.</p> | <p>Design of pasteurization equipment with direct ohmic heating. The aim of this work is to become familiar with procedures for thermal treatment of food materials. The literature review should be focused on principle of direct ohmic heating for thermal processing of foods and the construction of industrially used ohmic heating pasteurization devices. Based on acquired knowledge the basic design of the</p> |



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| | ohmic heating pasteurization device for aseptic processing of fruit or vegetable juices or purees (quarter to pilot plant scale) would be made. |
| Ing. Jaromír Štancl, Ph.D. | Design of pasteurization equipment with direct ohmic heating. The aim of this work is to become familiar with procedures for measuring the electrical conductivity of food materials in the form of literature review focused on methods of measuring the electrical conductivity of various substances. Based on acquired knowledge experimentally determine the dependence of the electrical conductivity of selected food material on temperature, moisture content or frequency. |
| Ing. Michal Netušil, Ph.D. | Air filtration. Research focused on the filtration of air pollutants. Providing of real filter elements and their test results. Evaluation of tests and recommendations for filtration of air pollutants. |
| Ing. Mgr. Vojtěch Bělohav | Harvesting of microalgae. Harvesting and dewatering have a major impact on operating and investment costs of technology for microalgae production. The aim of this thesis is to elaborate an overview of existing technologies for the separation of 3rd generation biomass from the culture medium. Based on the critical review, select the most suitable technologies that could be implemented on an industrial scale. For the selected microalgae species, elaborate the basic experimental measurement describing the physical properties of the culture medium and microalgae cells. Based on the experimental data, define the basic design and operational parameters of the selected technology. |
| Ing. Mgr. Vojtěch Bělohav | Microalgae biorefinery: High-value products perspectives. Elaborate an overview of existing biorefinery concepts processing 3rd generation biomass – microalgae. Describe the process diagram of selected technologies and define the parameters of the key equipment. Describe the final high-value products based on the different concepts of biorefineries. Based on the critical review, select a suitable concept that could be applicable in the Czech Republic and another concept applicable in the selected country. Elaborate a basic process flow diagram for the selected biorefinery concepts. |
| Ing. Stanislav Solnař | Static vs. dynamic methods. In experimental measurements, we can encounter two types of measurement methods, static or dynamic. Static methods are usually characterized by their transferability, but they are time consuming. Dynamic methods, on the other hand, are very fast and allow you to get a large amount of information in a very short time. Prepare experimental measurements, where you will compare both methods on the selected geometry. |
| Ing. Stanislav Solnař | Measurement of radiative heat flux. Measuring the heat flow in a solid wall is a fairly mastered engineering task. But what will happen when measuring heat flux in liquids and gases? And what if I need to measure the incident heat flux on the wall (eg from the sun)? Prepare a research on the topic of measuring radiative heat flux and prepare a design of a measuring element. |
| Ing. Viktor Vajc | Heat pipes. You will do a review of heat-pipe technologies used in various applications and examine different types of heat pipes as well as their pros and cons with respect to other means of heat transfer. In practical part of |



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the work, you will do calculations and basic design of heat pipe system aimed for cooling of a selected device.