DIDEA NEWSLETTER

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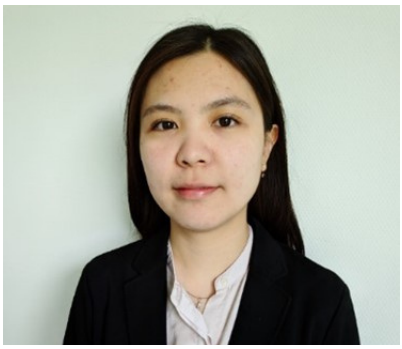
Over the last semester, social measures and regulations have become less stringent: giving the trainees a chance to get outdoors, enjoy the sun and engage in social activites, albeit in limited capacity. In a culture of hybrid working, our trainees have become adept to carrying out projects efficiently. Heading into the summer period, we celebrate the achievements and progress of some of our colleagues.

4TU.SAI TUDelft PDEng Design the future Didea Delft Ingenious Design Employees Association

Inaugural Johan Grievink Award: Gabriela Hadiwinoto



In 2020, the PSE-NL association instituted the Johan Grievink PSE Award for outstanding projects (BSc/MSc/PDEng/PhD) in the domain of process systems engineering. Gabriela Daisy Hadiwinoto, a PDEng trainee from the Chemical Product Design (CPD) was awarded with the inaugural edition for her Individual Design Project (IDP) on an extended protocol for the treatment of vitamin B12 deficiency. This design study was co-funded under the Interreg VL/NL HELIS Academy project.

According to the B12 Institute, the diagnoses and treatment protocol for vitamin B12-deficient patents should be improved for better and targeted solutions. Current diagnosis of B12 deficiency depends on the blood-serum levels. Unfortunately, these cannot provide information on the cellular activity of B12. Moreover, for patients with severe conditions, existing short-term treatment is not enough to resolve their health issue: a better treatment protocol is imperative.

During the project, biochemistry, and metabolism of vitamin B12 (cobalamin) were studied using a chemical engineering logic – parts of the body were broken down into a series of small reactors. Several hypotheses on the B12 cellular activity were proposed as outcomes: well-extended from the classical theory. These hypotheses were summarised in a series of vicious cycles between overlooked root causes and impacts of B12 inactivity.

Extending from these hypotheses, new biomarkers, and corrective actions (i.e., diet, supplements, etc.) were proposed to be clinically investigated to determine whether they could support treatment. These proposed hypotheses and the extended protocols are expected to open a new direction for clinical research & practice.

B12 institute

Helis Academy

Conceptual Design for Face Mask Disposal

At Delft University of Technology, Group Design Projects (GDPs) form an integral part of the PDEng programme. Therein, a team of trainees collaborates with an industrial organization to develop a new concept for the design of a process or product. In addition to design and engineering, such projects test the members' ability to assume different roles, manage deadlines, and adapt to difficult situations. For this edition of the newsletter, we take a look at the project of Tamoor Mughal, Ana Oliveira Alves, Silvia Polverini, Federico Consonni, and Ezgi Arslantürkoğlu – trainees from the February 2020 batch of the Process and Equipment Design (PED) track. The project was carried out in-house and was aimed towards investigating the economic potential of disposed face masks.

Over the last year and a half, the world has been facing the CoVID-19 pandemic. To help manage the rate of infections, face masks have become commonplace in public places. It is estimated that in the Netherlands alone, 10 million masks are used every day. Currently, these masks are being disposed of through incineration, along with other municipal solid waste. These masks can potentially be valorized using chemical processes.

With an a-priori assumption of separate mask collection, a preliminary analysis showed a waste stream of 10 tonnes per day - very small in comparison to an average chemical process plant. The stream consists of 80 wt% polypropylene (PP), 12 wt% of metals and elastomeric polymers. Of these, metals have a well-established recycling route. However, when talking about PP, it was imperative to choose a process that could operate on a smaller scale, when compared to most polymer recycling processes. Considering the temporal constraint on raw material abundance, the project would have to be technologically mature, with a payout time of less than 1.5 years to justify investment. Based on the screening criteria, thermomechanical pelletization of PP was found to be the most suitable option out of eleven initial ideas.

The process begins with a 5-day isolation of the masks in storage bunkers. This serves two purposes: inactivation of the virus and keeping feedstock for continuous operation. Following this, the masks are shredded down to a size where air classifiers can separate PP flakes from other components. Once separated, the flakes are washed in a caustic bath to remove any residual adhesive impurities. After a heating step for drying and softening, the PP melt is put through an extruder to form pellets. Finally, the extruded pellets are quenched to solidify - returning back to room temperature. From there on, they are sent for packaging.

Extending the life cycle of PP by making it into a usable input stream for subsequent applications incorporates circularity and improves the economic potential over the benchmark case of incineration. The editorial team would like to thank the PED team for sharing their results and wish the members good luck for their upcoming projects.

Prediction of Oil Oxidation in Infant Milk Powders

The Individual Design Project (IDP) makes up the second year of all PDEng programmes. It challenges trainees to put their technical & managerial skills to test for a company's design problem. Engaging with a variety of stakeholders viz. the funding organization, section experts, researchers and intended clients, the trainees formulate solutions that meet their requirements. For this edition of the DIDEA newsletter, we share the experiences of Marina Carrer. As a Chemical Product Design trainee, Marina was seconded at Danone Nutricia Research in Utrecht to model oil oxidation of infant milk powders during their shelf-life.

Infant nutrition is a complex consumer market: Danone has a wide product portfolio that promotes healthy infant growth. In order to emulate human milk, infant formulae are manufactured with oil blends rich in polyunsaturated fatty acids (PUFAs) that are necessary for the development of the baby. However, owing to their chemical nature, PUFAs are prone to oxidation during the long product shelf life (1.5 – 2 years). The chemical reaction leads to development of off-flavours affecting the consumers' perception of the product. The timescale of product storage and expensive sensory evaluations make product development challenging. To shorten the lead times, it is therefore necessary to gain insight into the oxidation process. Consequently, Marina was tasked with the design of a model that considers oxygen transport as well as kinetic phenomena within the pack of infant formula to predict the rate of oxidation for a variety of powder formulations and local parameters.

To this end, Marina designed experiments and collected data in collaboration with Danone and external laboratories, besides working with the data provided by Wageningen University. In her experience, Marina found both, the learnings from the Project Management course and strong communication skills to be of vital importance - keeping all stakeholders updated and seeking expert assistance. In addition, good organizational skills were cardinal to keeping up deadlines and adapting to changes in scope. Even though the project began in February 2020, amidst the pandemic outbreak, Marina enjoyed the welcoming atmosphere at Danone and made the most of her secondment: proactively participating in team activities and workshops. In the end, she was able to successfully develop a transport-kinetic model that predicts the formation of oxidation products relevant for consumers' response in baby milk powders packs. The editorial team would like to wish Marina good luck for her upcoming endeavours.

Refeel: Redesigning the Future of Personal Care Products

The average consumer uses hundreds of plastic bottles for personal care every year. As none of the packaging for shampoo, conditioner, bodywash, toothpaste or mouthwash are refillable, every person adds about 50kg in plastic waste to the planet every year. This plastic waste is 'single-use' in a sense, with short lifespans and narrow scope of usage. Over the last half-year, alumnae and current PDEng trainees: Kleopatra Papamichou, Sandy Pantou and Maria Liouta have been pursuing the idea of Refeel, a system integration idea that has the potential to achieve reduction in the waste derived from personal care products.

Under the umbrella of the TU Delft Impact Contest, the trainees were able to compete against different ideas in a corporate-accessible environment. Equipped with the Delft Design Map methodology (DDM), and coaching sessions by field experts, the team was able to express their unique service proposition using a business model and gained experience in the aspects of Pitching, seeking collaborators and funding.

Refeel's vision is to change the way people deal with plastic packaging. The first step towards this is to design an attractive recyclable shampoo bottle that can be refilled multiple times. The second step is to create a vending machine that can refill bottles with a customized formula. The vending machine would instantly mix a base shampoo formula with the customer's desired colour and fragrance. These vending machines would be placed in multiple, easily accessible locations. In addition to reduction of plastic waste, Refeel aims to value diversity and uniqueness.

During an interview with the editorial team, the team members expressed their plans to continue pursuing the idea in the future. In addition, they encourage fellow trainees to actively participate in similar competitions. The Refeel team believes that this is essential to develop a business-oriented mindset. The editorial team would like to wish the Refeel team best for their upcoming endeavours.

TU Delft **Impact Contest**
Launch your start-up idea

Refeel

DIDEA's Social Corner

Over the last year and a half, the CoVID-19 pandemic has forced most of us to adapt to a different, 'work-from-home' routine. Regulations and safety measures have altered the way we interact socially. Nevertheless, to foster interaction between different batches of PDEng trainees and promote social inclusion, the DIDEA Social Committee has been organising a variety of events while keeping CoVID-19 regulations under check.

The semester began with an online blind-date wherein the PDEng trainees could get to know each other in Zoom breakout rooms. This was followed by a treasure hunt across Delft, so that new trainees could explore the historic Delft city centre. In addition, online workshops on Yoga and Italian cooking provided times of relaxation and leisure after hours. The final event for the semester followed the easing regulations: asking trainees to get outdoors and explore nature via the 'Stepz' challenge. Organised over three weeks in teams of two, the trainees were challenged to achieve walking tasks in and around Delft. At the end of the challenge, the team with the most challenge points and steps were declared winners.

The Social Committee would like to applaud the trainees' competitive participation and hopes to organise more events in the future.

Created by the DIDEA Newsletter Committee

Articles - Shubham Wankhede

Cover photos - Jenkins Jose Shirley

Design Layout - Antonios Dafnomilis, Francesco Franco