**Wicked Sustainability**

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**ABSTRACT**

Technology systems are not just increasingly important physical and structural elements of an increasingly humanized earth characterized by complex human systems. Because technologies are connected to the economic, social, and cultural systems, they enable, and in turn are enabled by, just adds extraordinary levels of complexity. So to turn this complex world into a sustainable world would it be sufficient to make even more devices although green?

I would say: It's necessary but far from adequate or sufficient.

We need to redefine the contested concept: “Sustainability” Since philosophers are especially good at providing conceptual clarification, they are an especially good group of people to turn to for enhanced understanding of wicked problems, especially ones like sustainability that are, at bottom, rooted in normative disputes.

My contribution to ‘Grøn Dyst’ is driven by my wonderings regarding the seemingly easy solutions we present to the problems, which follow, from our increasingly more complex way of living in the world. As I noted above the global policymaking fails to address the fact that; the coupled global systems of atmosphere, ocean, biology, economy and equity are being addressed by constructs such as “carbon footprints”. This, I would say, is adequate demonstration of failure to understand and respond ethically to adaptive complex systems - especially ones of which humans are an integral part. My project is an attempt to analyze and give a redefined understanding version of ethics. In this matter ethics is to be understood as the tool we use to decide what to do - to do the right, valid and sound thing. Establishing process is just as important in many ways as explicitly ethical framings at a particular point in time. In the Danish language we use the same word for “soundness” of a particular point in time. In the Danish language we use the same word for “soundness” of a particular point in time.

**Flue gas DeNOx with SILP**

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**ABSTRACT**

The main component of atmospheric air is nitrogen. During combustion at high temperatures, nitrogen can undergo oxidation, thus making nitrogen oxides (NOx gasses). This occurs frequently when atmospheric air is used as oxygen supply for combustion processes, whether it be in coal, biomass or oil fueled power plants, combustion engines for transportation, or other combustion processes. Especially the NOx gasses, NO and NO2 are toxic, and harmful to the environment. These gasses make acid rain, and contribute to depletion of the ozone layer.

This project focuses on flue gas DeNOx from smaller sources, such as diesel engines. Processes are already in use for DeNOxing flue gas from power plants and gasoline engines. For gasoline engines, a three way catalyst is used, this cannot however be applied to diesel engines, due to a much higher oxygen content in the exhaust gas. The process used in power plants is called SCR (Selective Catalytic Reduction) and uses concentrated ammonia and a catalyst to reduce the NOx gasses into harmless nitrogen. The process demands a big reactor, and concentrated ammonia, which is both a major health risk and environmental risk in case of accidents.

This project explores the opportunity of installing an efficient DeNOx unit in the exhaust of a diesel engine, thus cleaning the flue gas. The DeNOx unit will consist of a SILP (Solid Ionic Liquid Phase) absorber. The SILP absorber is made up of porous particles and an ionic liquid, in this case [BMIM]NO3. The porous surface creates a large surface area on which the reaction can occur.

The SILP uses the excess air and water in the flue gas, to convert the NOx into nitric acid, which is captured and stored in the ionic liquid. Tests were conducted by exposing a SILP reactor to a simulated flue gas mixture. The NOx concentration was monitored by a UV-VIS Spectrometer. The spectrometer was set to obtain a spectrum at wavelengths from 250 nm, to 200 nm. At these wavelengths it is possible to monitor NO and NO2 simultaneously. The results clearly state that it is possible to remove all of NO and NO2 for a significant period of time. When the maximum capacity of the SILP is reached, it is possible to simply desorb the nitric acid from the SILP, by heating it to a temperature above 80°C, in a stream of gas. The capacity of the ionic liquid in the SILP is around 1.05 moles of HNO3 per mole of ionic liquid, at room temperature. Even though the maximum capacity of the ionic liquid is lowered at higher temperatures, the conversion of NOx to nitric acid becomes faster.

The SILP is reusable, and there is no apparent drop in capacity when reusing the SILP. The nitric acid that is produced from the reaction can be obtained, and used in the chemical industry. Nitric acid is one of the most produced chemicals in the world, and this technology will thus be able to both reduce the NOx emission from transportation, while lowering the amount of nitric acid produced in the chemical industry each year.