Up and Coming Sustainability Challenges in the Design of the Data Centre Equipment.

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From personal lives to global management - our society depends on fast, uninterrupted 24/7 data transfer. Data Centres (DC) across the globe process billions of gigabytes of data every day and the demand for more data processing power due to technological advancements is ever-increasing. DC equipment is known to be energy-intensive producing high levels of heat and currently, around 40% of the energy consumed by the DC equipment is spent on air-cooling. What is more, the industry's energy demand is predicted to reach about 200TWh by 2021, (IEA, 2019; Masanet et al., 2020).

One efficient way of dealing with the heat produced by DCs is repurposing waste heat which has already been adopted by the data giants like Amazon and IBM.

Yet, DC operators are looking for alternative, more energy efficient ways of cooling. A popular way of reducing power consumption is through the use of liquid cooling technologies such as direct-to-chip, oil-based fully immersive and developing chassis-based immersive cooling, that offer up to 30% on total energy savings and increased Power Usage Efficiency (PUE). The emerging chassis-based immersive liquid cooling technology is gaining popularity. It works by containing oil-based dielectric liquid within sealed chassis and delivering cooling to the chips through built-in heat micropumps. (Schneider Electric, 2020).

However, liquid cooling brings new challenges when it comes to handling of the equipment at end-of-life (EoL), as has already been the case with oil-based fully immersive cooling. Traditional air-cooled server equipment has partially adapted to fit Circular Economy (CE), with repair, refurbishment and recycling techniques and a market segment that drives sustainability within the sector. New chassis-based immersive-cooled equipment will require a completely new approach at the EoL because these server units are sealed containing liquid and different components. Current proposed EoL approach is replacing the whole unit and returning spent equipment back to OEM as the equipment does not lend itself easily for onsite repair which impedes on a secondary-use market and hinders DCI progress towards CE.

It appears that present design thinking significantly lacks in balance between striving to optimise the performance and operational energy requirements and designing for circularity.

This paper describes the challenges facing DC industry in its drive towards optimum Energy Efficiency and sustainability, proposing Life Cycle Assessment approach as a decision-making instrument to encourage design for circularity within DC sector.