Abstract

- Modify the Abstract - Ragu

Introduction - Ragu

- Background & Motivation

- Sustainability Framework introduction

List to Review - Ragu

- What others have done

- Research challenges and Gaps

Sustainability Framework for Learning Factory - Sangje

- Why in Manufacturing

- Why Sustainability Cloud

- Reference Architecture Framework – Sangje



              - Level 1

              - Level 2

              - Level 3

              - Level 4

              - Level 5

Implementation details



Benefits of Framework - Bala

- Talk about how we can calculate sustainability KPI’s and build a calculator

Sustainability in manufacturing is going to be translated to energy consumption used, water or other oil, scrap or waste that are consumed or used in the entire manufacturing process. Some of the major KPI we can calculate are Energy used and for every kwh used what was the carbon footprint released to the environment. How does that relate to carbon tax, what are the measures in place to augment carbon intake and convert to oxygen and release in environment. Other means like water used, how is the water polluted, how can we clean the pollutants and recycle drinking or safe water that can be used for drinking or agriculture.

Foundry Smoke and carbon emission can be capture and recycled and cleaned. Scrap and other material waste, instead of get rid of that, can we recycle or re forge and use that into the manufacturing process.

To achieve this we need in a factory, we need to monitor each assembly line, station and see how much energy is consumed, how much air is used, oil consumption, how much water is used in any way for normal operations or cooling or other methods. Idea is to collect those and store in sustainable data model, collect government or environmental data to figure out what would be the environment impact indicators and update that in sustainable data model. We must collect these in context of assets used in manufacturing. Asset Management details might come from another external system or Manufacturing execution system with recipe definition on what the assembly line is built for. By combining Learning factory data model which is the MES/ Asset management models and combine that with Sustainable data model to feed the digital twin to monitor and display current information. Sustainability data model collects and stores data in historical fashion. This allows us to do machine learning to build advanced analytics to project carbon emissions, other environmental factors to calculate carbon tax based on location or other environment impact assessment.

Once we have the data, then we can figure how to reduce the environmental impact. Carbon calculation metrics are some things define by environmental agencies; we calculate based on their guidance.

Future Work & Conclusion – Ragu/Bala/Sangje