All Roads Lead to The Environment

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1. Background

Since 2015 when the United Nations adopted the Sustainable Development Goals (SDGs), various efforts have been made by governments, businesses, and citizens all over the world to achieve goals/targets by the year 2030. [Figure 1]

Particularly technology-driven innovation is expected to be a significant contributor to the solution of major SDGs challenges. The AEC/APC Symposium, held rotationally in Europe, the U.S., and Asia, helps find technological solutions from its discussions and outcomes.

For the emerging/new technologies to function as a sustainability-based comprehensive concept and/or effort, we need to have a road map to the goal as well as to grasp how the issues, technologies, and SDGs are related to each other.

2. Purpose

Recently, extreme weather events due to global warming have become more frequent and severe, affecting our society and economy. Achieving the SDGs is regarded as an important approach to the problems linking to climate change.

Key to the success of SDG's are circular economy business models (effective use of limited resources of the earth). In addition, we need to employ 3R-conscious product designing, recovery /recycle /sharing in supply chains, and longer operating lifespans of products/manufacturing facilities.

The purpose of my presentation is to provide a concrete generic framework and clear idea of the goals, using some of our real examples and outcomes with regards to sustainable technology in terms of environmental technology and circular economy.

The examples show how we apply environmental technologies from a business perspective toward the SDGs using certain evaluation methods. The presentation also proposes that the ongoing streamlining of electricity, utilities, and chemicals used in the fabs can create a new value when viewed from a different angle.

3. Methods and Approaches

Three types of environment assessment indexes and methods are used in combination for reducing environmental loads: (1) energy/utilities - calculated as total energy by SEMI S23 electricity equivalent conversion, (2) chemical. and (3) resources (materials and consumables) - based on global warming potential and CO2 inventory data in life cycle assessment (LCA). [Figure 3]

The comprehensive concept consists of three pillars: (1) conceptual change from usage reduction to efficiency improvement, (2) wider perspective from supply system (upstream) to exhaust system (downstream), and (3) linkage. [Figure 4]

4. Examples

First, the recycling and reusing of waste liquid significantly reduced the liquid consumption and waste load. Second, zero rare material scrap was achieved by improving the efficiency of use and through the renewal and reuse of the remainder by the manufacturer. Third and lastly, dry cleaning made quartzware life longer, reducing the waste.

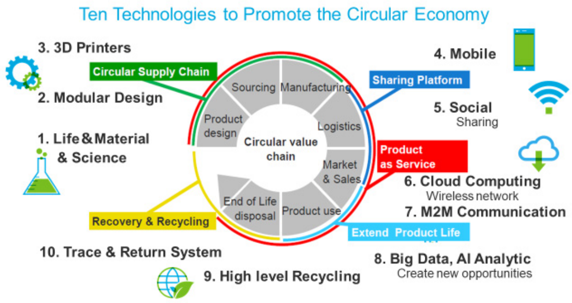
These real examples explain how we achieved circulation and waste reduction over the entire product life cycle from design to disposal.

Finally, the presentation also proposes future applications, such as AI technology-driven optimization of resource circulation by matching the circulation destination and digital twin-driven reduction of chemical/energy use in the process evaluation development. [Figure 5]

5. Conclusion

Solutions to technical problems will also serve to provide solutions to SDGs and help the wider society beyond. Every technology leads to the environment. [Figures 6 and 7]

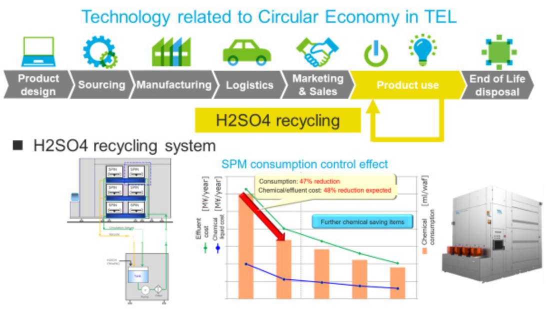
[Figure 1] 17 Sustainable Development Goals



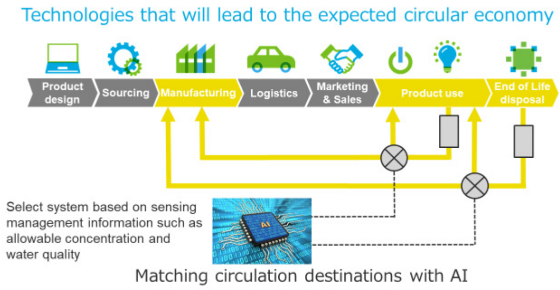
[Figure 2] Circular economy

Utility or Materials	Energy Conversion Factor
Exhaust	0.0037 kWh/m3
Vacuum	0.0060 kWh/m3
Dry Air	0.147 kWh/m3
Water	0.260 kWh/m3
DIW Temp.＜25C	9.0 kWh/m3
DIW Temp.＞85C	92.2 kWh/m3
N2	0.2550 kWh/m3
Electricity	1.00 kWh/m3

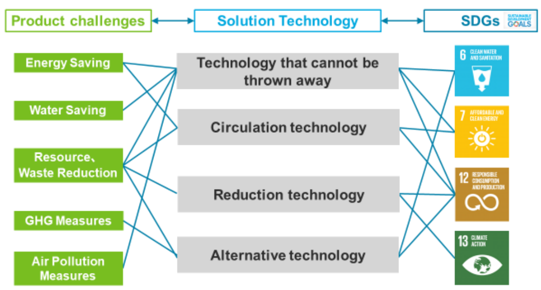
[Figure 3] SEMI S23 Energy Guide



[Figure 4] Technologies leading to a circular economy



[Figure 5] Technologies leading to a circular economy



[Figure 6] Correlation between challenges and goals.

[Figure 7] All roads leads to the Environment