KEYNOTE – THE LEGO GROUP

The Journey of Developing Sustainable Materials for LEGO Bricks

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Summary:
In 2015, LEGO announced it would set Sustainable Materials Goal to meet by 2030, with the understanding that this would be an 'adaptive challenge' as there was no reliable way to forecast success 15 years in the future. The drivers for setting this goal include acknowledgement of the growth in the 'belief-driven' buyer who is highly concerned about the global plastic pollution crisis, as well as the global youth movement pushing for aggressive policy actions to address harm to future health of the planet.

LEGO is addressing energy consumption at the corporate and manufacturing level. LEGO has addressed adoption of more sustainable energy used by its facilities through installation of wind turbines and solar panels. However, approximately 75% of energy consumption occurs during manufacturing, so LEGO has committed to increasing use of more sustainable materials in its core products and packaging.

Søren highlighted important product attributes that need to be in place for all LEGO products. Most important is to determine what product characteristics optimize the play experience. The goal is to produce more sustainable products that do not trigger a perceptible product difference for the consumer. LEGO guidelines for sustainably sourced material development require that bio-based material for both product and packaging meet the following requirements:

- Feedstock must be ethically sourced and manufactured and cannot negatively impact food security.
- Material must be safe for the consumer -- cannot compromise on human safety.
- Material must be recyclable generate minimum waste along the value chain.
- Consumer-perceived quality or durability (lifespan) cannot be compromised.

The initial strategy for assessing product safety was to examine the safety assessments of existing monomers and polymers and filter based on safety and desirable performance attributes. Starting in 2014, LEGO began to add bio-based materials to their product line, specifically incorporating bio-based polyethylene generated using wind-turbine energy. However, feedback from the Ellen MacArthur Foundation to take product circularity into account encouraged LEGO to create new parameters for assessing carbon circularity for their plastic production. This initiative is ongoing, and LEGO is clear that it requires engagement across the value chain, and solution-building with other stakeholders, including universities and NGOs.

Unfortunately, biodegradable polylactic acid (PLA) thermoplastics are still not in an ideal state to fully replace the desirable material (functional) properties of ABS so they are not a viable material replacement

at this time. Also, continued degradation studies for new materials and colorants are critical since there are no long-term studies available for new/emerging materials. There is a need to understand normal exposure scenarios of these products for consumers, including in sunlight and with detergents to accurately assess the lifespan of a product under different stressors.

It is important to understand the different options and limitations of managing plastic at its 'end-of-life' stages. For example, the advantage of mechanical recycling is that it requires low energy consumption, but challenges include very tight restrictions on impurities. There are new depolymerization technologies emerging, that are more energy-intensive but increase the supply for virgin material (bringing materials back to base monomers that can then be used as feedstock for virgin material).

Key Takeaways:

- Understanding what leads to a good 'play experience' for children is a critical element of developing sustainable materials for toys.
- Setting expectations for sustainable product development is an 'adaptive challenge'.
- Industry and academia are important partners for creating sustainable solutions.
- In the production of truly sustainable materials, one must consider the balance of resource integrity, availability, and renewability along with waste management and reduction to approach more realistic parameters around product circularity.