Creating Value through Sustainable Manufacturing
**Research Objectives:** To define sustainable manufacturing for mid-sized manufacturers and develop a framework to facilitate the transition from business as usual to sustainable manufacturing.

**Motivation**
- Industrial manufacturing is responsible for 30% of greenhouse gas emissions in the United States.
- UD-IAC has conducted 950+ energy assessments and is looking to expand its services.

**Sustainable Manufacturing**
- The transformation of Earth’s resources into valuable goods and services, while cultivating a greater quality of life and safeguarding our environment.

**Roppe Case Study**
- Roppe Corporation: “We’re not just committed to making better products—we’re dedicated to making a positive impact on the environment as well.”
- Roppe has begun to meet their goals by hiring a sustainability manager, performing product LCA, continuously improving resource efficiency, and reinvesting in their community through scholarships funded by recycling efforts.
- A couple months after a UD-IAC audit, Roppe has implemented more than half of the assessment recommendations.

**1. Company Culture**
- Ford Motor Company at Dearborn reduced heating and cooling loads by 5% by installing a green roof, which also improves air quality, increases wildlife habitation, reduces urban heat effect, and reduces storm water runoff.
- Melink Corporation incentivizes employees to purchase electric cars.

**2. Management Systems**
- The Plan-Do-Check-Act (PDCA) cycle establishes a process for manufacturers to achieve their goals.

**3. Zero Carbon Manufacturing**
- An energy-efficient manufacturing facility where the actual CO₂ emitted is less than or equal to the CO₂ offset.

**4. Zero Waste Manufacturing**
- Zero Waste International Alliance allows for 10% to go to landfill.
- UD-IAC developed the Material Efficiency Guidebook to easily and consistently identify savings.

**5. LCA - Truck Manufacturer**
- About 92% of lifecycle energy is consumed in the combined use and fuel cycle.
- Production and assembly account for 7% and 1% of energy use.
- Greatest gains are from improving product (rather than process) efficiency.

**Conclusion**
- Ultimately, sustainable manufacturing is not about limiting growth and living in austerity, but producing goods and services that create abundance and prosperity.