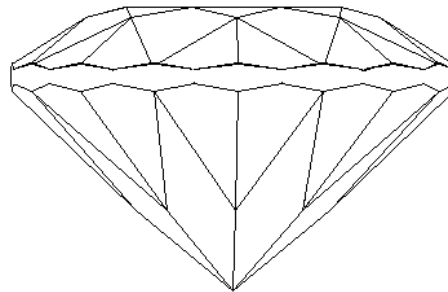


Sustainability *and* Gemstone Attributes



Chris Trummel
AET Films



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Why am I Standing Here?

- **AET Films – OPP Film Manufacture**
 - 85% is used in Packaging or Container Decoration
- **Consumer Perception**
 - Packaging = Trash or Waste
- **Packaging Facts**
 - Protects, preserves, represents it's contents
 - Done correctly, it reduces waste



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Sustainability – What is it to you?

Renewable

Reduced Product Waste

Toxicity

Carbon Footprint

Composting

Recycling

End-of-Life Use

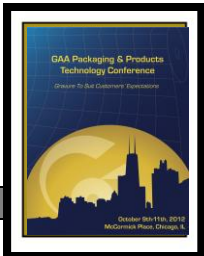
Ease of Use

Source Reduction

Bio-Based

Biodegradable

Recycled Content



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Parameters & How they Relate

Package Life Cycle

End-of Life

- Solid Waste/Biodegradability
- Recyclability
- Compostability

Design & Specification

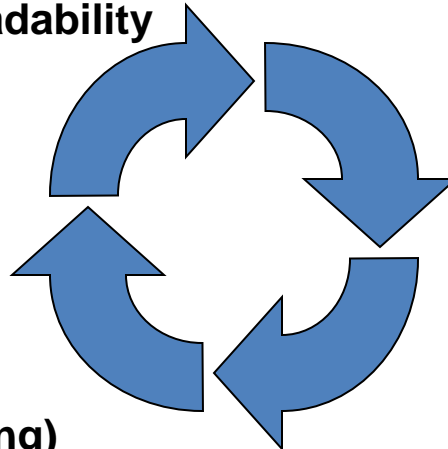
- Source Reduction
- Renewable Sources
- Recycled Content

Use (Fitness for Use)

- Ease of Use (Dosing)
- Reduced Product (Food) Waste
- Product Protection
- Brand Identity

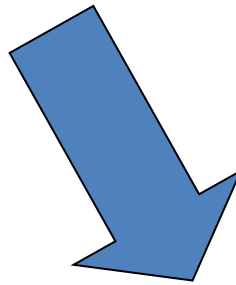
Manufacture

- Carbon Footprint
- Emissions/Waste
- Reclaim



Consumer Perception

Green and Sustainable



Recycled



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Flexibles versus Rigid

Rigid

- ★ End of Life
- ★ Product Protection
- ⊘ Source Reduction

Flexible

- ★ Source Reduction
- ★ Product Waste
- ⊘ End of Life



Flexibles – Benefits & Challenges

Positives:

- **Economical – Weight to Benefit Ratio**
- **Excellent Brand and Shelf Life Attributes**
- **Outstanding Energy Recovery (Fuel value)**
- **OPP and others offer low Carbon Footprint**

Negatives:

- **End of Life Challenges**
 - **Recycle Economics & Infrastructure Lacking**
- **Compostability**
 - **Limited options/Lack of Infrastructure**
- **Biodegradability & Landfill Waste**

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What to Do?

Position Substrate Options Properly

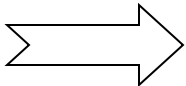
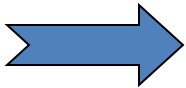
- **None resolve End of Life Recycle Concerns**
- **End of Life Composting can be addressed**
 - **with reservations (Infrastructure & Cost)**
- **Biodegradation must be understood by stakeholders**
- **Renewable & Recycled Content options emerging**
 - **PLA and Pulp based films**
 - **Re-used polymeric streams**



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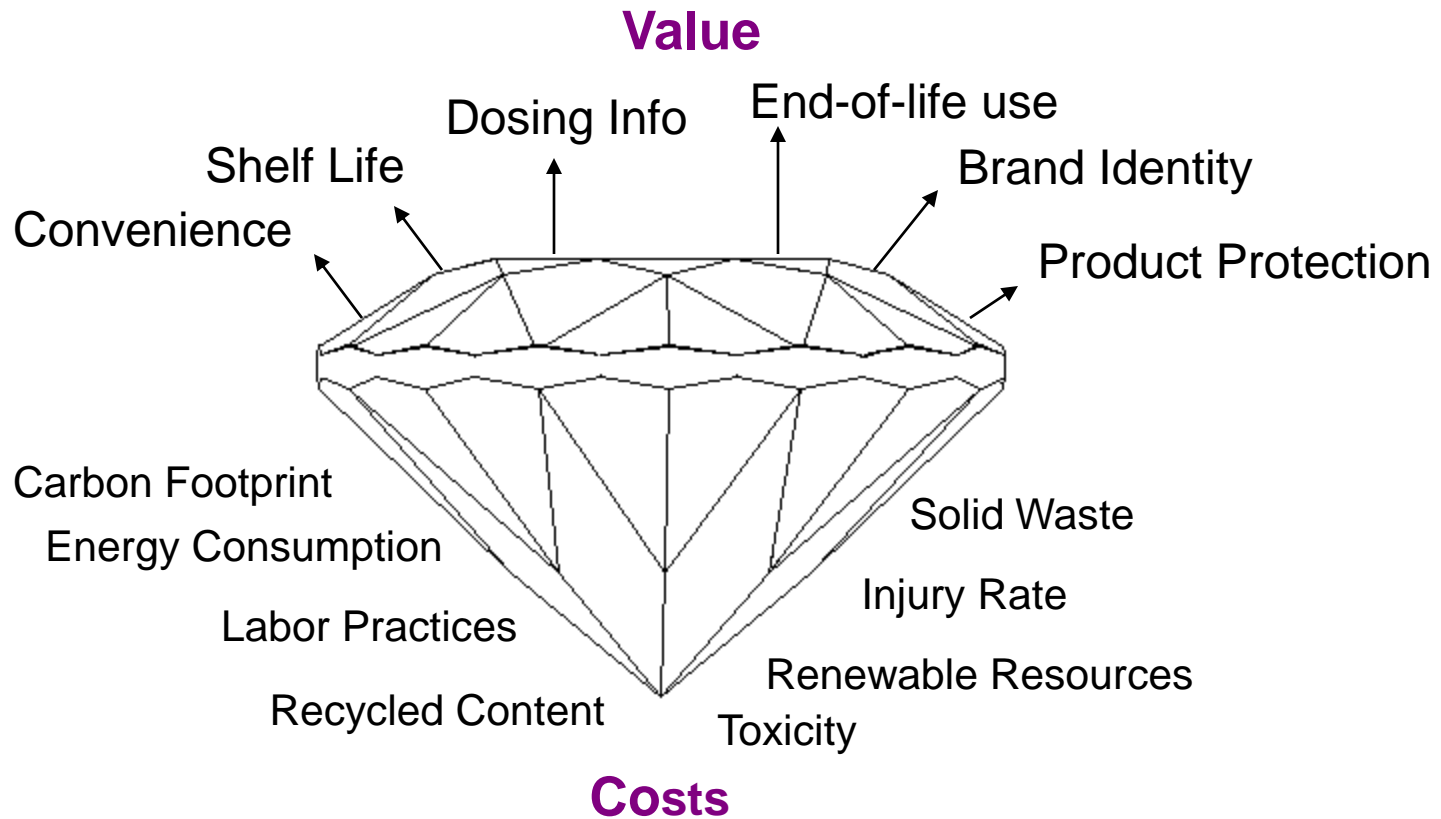
Why This – Why That?

	BTU/g	g CO ₂ e/g	g/cm ³	g CO ₂ e/msi	BTU/msi	Reference
rPP	3.42	0.4879	0.905	7.2	51	[3] Table 5.5 & 4.5.2
rHDPE	8.2	0.6145	0.95	9.6	128	[2] Table 3-2, 3-6
rPET	15.9	1.147	1.39	26.1	363	[2] Table 3-1, 3-5
PP	76.9	1.867	0.905	27.7	1,141	[1] Table 5-1, 5-4
LLDPE	78.7	1.923	0.92	29.0	1,187	[1] Table 4-1, 4-4
HDPE	78.9	1.890	0.95	29.4	1,229	[1] Table 2-1, 2-4
LDPE	84.0	2.208	0.925	33.5	1,273	[1] Table 3-1, 3-4
rPaper	23.9	1.711		41.5	580	[4], 10-lb/ream
PVC	56.0	2.143	1.25	43.9	1,147	[1] Table 9-1, 9-4
GPPS	93.7	3.172	1.04	54.1	1,597	[1] Table 7-1, 7-4
HIPS	94.6	3.192	1.06	55.4	1,643	[1] Table 8-1, 8-4
PET	70.3	2.797	1.39	63.7	1,602	[1] Table 6-1, 6-4
ABS	103.2	3.749	1.04	63.9	1,758	[1] Table 10-1, 10-4
Paper	33.0	2.940		71.3	800	[4], 10-lb/ream



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The Sustainability Gemstone



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Summary

- **No Gemstone is PERFECT**
 - Recognize each for it's unique blend of characteristics
 - What Characteristics are Important to the Users?
- **Changing One Facet effects all Others**
 - Product Life Cycle Analysis (LCA) is an evaluation tool
 - Trade-offs are a FACT of life
- **End of Life issues are Flexibles Critical Issue**
 - Industry & Public focus will be needed



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