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Two Approaches to Reduce Emissions

More fuel with less carbon – advanced low carbon biofuels

Engine Technology
More miles with less fuel

Cellulosic materials: low carbon and with long term sustainability. Combined with efficient biofuel engines, emission reductions result.

Shaver, 2014
Outline

**Basic Biomass Chemistry**
1. Types and Sources of Biomass
2. Structure of biomass
3. Structure of plant cell wall
4. Structure of polymers in plant cell walls

Break

**Enzyme Hydrolysis and Pretreatment**
5. Release of inhibitors / plant protectant effects
6. Mechanisms of hydrolysis
7. Impact of chemistry on pretreatment approaches
Outline

**Bioprocess Design**
1. Materials Handling
2. Unit Operations
3. Scale-up

Break

**Sustainability**
4. Role of Agriculture
5. Population trends and energy use
6. Global environment
7. Conclusions