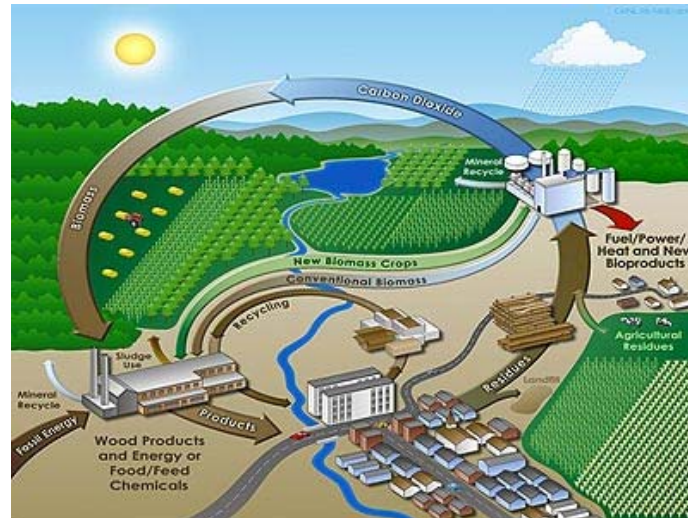


Energy from Biotechnology



Bio-technology Design Challenge

You are being asked to help a local Alternative Fuels company to design and construct a **Bio**-technology system that will produce ethanol as a substitute for gasoline.



The system must be designed to use yeast cells that will change sugar into a biofuel called ethanol. The yeast cells must be immobilized so they do not get mixed up with the sugar solution they are converting to ethanol.

Tell me about **ENERGY**

Renewable Energy?

Nonrenewable Energy?

Alternative Energy: *Bio*fuel?



Forms of energy:

Electrical: power in our homes

Kinetic: energy created by motion

Chemical: a form of fuel to power cars



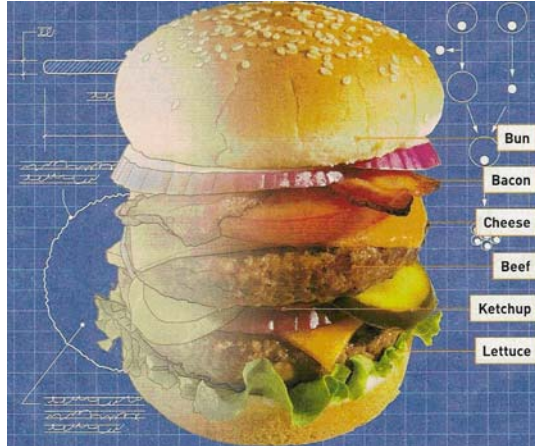
Definition of Biotechnology

Biotechnology is any technique that:

- uses living organisms (or parts of organisms)
- make or modify products
- improve plants or animals
- develop microorganisms for specific uses

Where do we use biotechnology?

A biotechnology?	YES/NO
1. Hearing Aid	
2. Baking Bread	
3. Braces for your teeth	
4. Composting	
5. Artificial Knee Joint	
6. Yogurt	
7. Heart Pacemaker	
8. Blue Cheese	
9. Contact lens	
10. Gasohol	



What is a *BIO-reactor*?

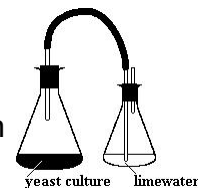
- **A bioreactor is**

- a any vessel in which cells, microorganisms, and even enzymes or proteins are used for producing a useful product from a biochemical process such as fermentation



- **What is fermentation?**

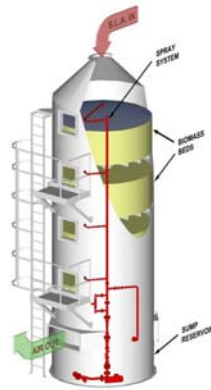
- an anaerobic (without air) biochemical process where a microorganism converts one substance into another, such as when yeast convert sugars to ethanol and carbon dioxide



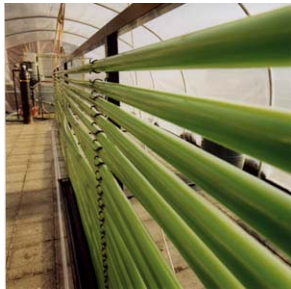
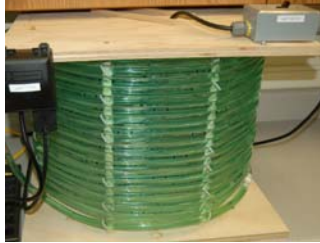
Are these *BIO-reactors*?



Are these *BIO-reactors*?



Are these *BIO*-reactors?




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Design Challenge Review

- ✓ What is the biotechnology **design problem**?
- ✓ What technology **system** must we design?
- ✓ What **biofuel** does the system convert sugar into.....?
- ✓ What **organism** must we use to do this?
- ✓ How do we **keep** the organism **separate** from the biofuel it makes?



Biotechnology Design Challenge

What will we learn about tomorrow?

- ✓ Phases of technological/engineering design
- ✓ Parts of a bioreactor
- ✓ How to immobilize yeast cells

