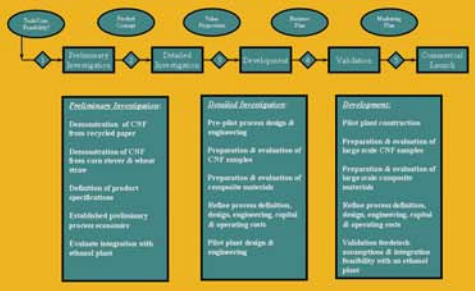
# Developing a Biomaterials Industry in North Dakota

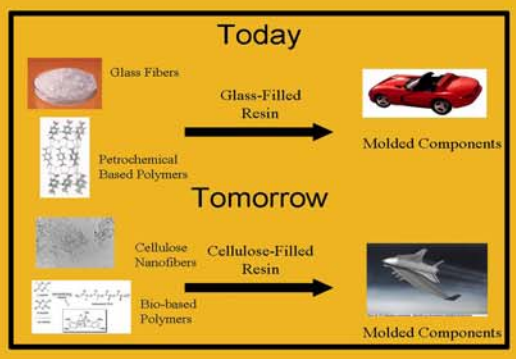

**Commercialization Process Flow Chart**




**Cellulose nanowhiskers (very small fibers) would be processed from wheat straw and mixed with a biobased polymer to produce a low cost, biodegradable replacement for glass fibers in polymer composites.**

**Cellulose Nanofibers Biorefinery Process Flow Diagram**


- ~ North Dakota is well placed to capture the economic benefits of the emerging biobased economy
- ~ Wheat straw is the preferred feedstock; a higher percentage of cellulose and lignin and lower cost than switchgrass
- ~ 71 percent of operating costs ($74.6 million) would be local payments to farmers, custom balers, transportation
- ~ An integrated biorefinery would employ 77 workers and result in more than $50 million in annual payments to ND entities
- ~ Much work still to be done; analysis to date has been done at the lab scale
- ~ Production processes will improve: increasing yields and reducing costs of cellulosic ethanol production
- ~ Pilot plant is critical next step

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