INNOVATION NATION
CO_2 Carbon Dioxide

Our reliance on fossil fuels compounds the release of CO_2 emissions, contributing to global warming. Transportation (Cars, Trucks, Airplanes, Ships) is responsible for more than 10% of global CO_2 emissions.

Professor Klaus Lackner and Alan Wright of Lenfest Center for Sustainable Energy at the Earth Institute, Columbia University, have collaborated in designing an artificial tree. Constructed from strips of a membrane used in water purification, it is capable of absorbing carbon dioxide emissions in urban areas. Watch the invention go through a test of absorbing ambient air at New York City's Times Square and see how then releases CO_2 for storage or other use, all that is needed is water. Once dry, the artificial tree is ready to be reused. In 1 hour each "tree" releases ¼ liter of absorbed CO_2. A real tree stores a tone of CO_2 at the end of its life. The material assembled in a machine that takes up the same size can absorb that amount every day, making the artificial trees much more efficient at CO_2 absorption.

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A Nobel prize winner on the Canadian prairies of Saskatchewan, Dr. Malcolm Wilson helped set up the International Test Center for CO_2 Storage at the University of Regina, where he works on developing a more and more cheap and durable Amine – a chemical solution that absorbs any CO_2 that passes through it and releases CO_2 in pure form when heated. Watch an Amine go through a test at a coal power plant, the kernel of carbon emission problem. Coal burning emits sulfur, nitrogen, oxygen, CO_2, and coal is on the rise in India and China. 1.5 oz of coal will run 100-watt light bulb for half an hour. An average household burns 40,000 lbs of coal a year.

Sask Power, key utility company in Saskatchewan, plans to retrofit coal-fired power plant with a carbon capture unit.

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Once the captured carbon dioxide is released, what can be done with it? Stat Oil, Norway's largest oil company, mines for natural gas in the North Sea. The process includes removal of CO_2 from the mined gas mixture. It is piped down 3 km-long well, injected into a trap underneath the seabed. This underground storage prevents one million tons of CO_2 from being released into the atmosphere each year. That is equal to emissions of 400,000 cars. With 24/7 monitoring, 8 million ton has been stored so far with no sign of leakage. Observe a team conduct seismic testing to find safe locations for CO_2 storage in Norh America and learn the kind of rock formations needed for an injection site. CCRL Refinery in Regina, Saskatchewan has works under way, while an International project between Saskatchewan and Montana plans on capturing emissions in Canadian coal plant and transporting it to USA for storage.

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But another option is proposed by Byron Elton of Carbon Sciences in Santa Barbara, California. He hopes to turn CO_2 into fuel source. Microorganisms do this with enzymes, but it is a time consuming and energy draining process. Watch how the search for a faster and more efficient solution in the lab has led Byron's team to cut down the time of transformation of CO_2 into fuel from ten hours to under ten minutes. With no need for large reactors to store ten-hours worth of emissions, this is a much more commercially viable solution. The goal now is to continue to make the process faster and extend the life of enzymes.

Questions

Q: Why is the artificial tree cut into strips making it look like an evergreen branch?
A: To increase surface area of absorption.

Q: What are the ways to capture carbon dioxide?
A: Absorb it with an artificial tree or pass it through an amine.

Q: What can be done with captured carbon dioxide?
A: It can be stored underground or converted into fuel.