

# Large Area Membrane Contactors for CO<sub>2</sub> Capture

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**NETL CO<sub>2</sub> Capture Technology Meeting**

Monday, July 9, 2012

# Membrane Technology & Research

- MTR develop, manufacture, and sell membrane gas separation systems.
- Main markets: Petrochemical, Natural gas, Refinery
- 70 employees
- MTR is developing membrane technology for post-combustion ( $\text{CO}_2/\text{N}_2$ ) and pre-combustion ( $\text{H}_2/\text{CO}_2$ )  $\text{CO}_2$  capture

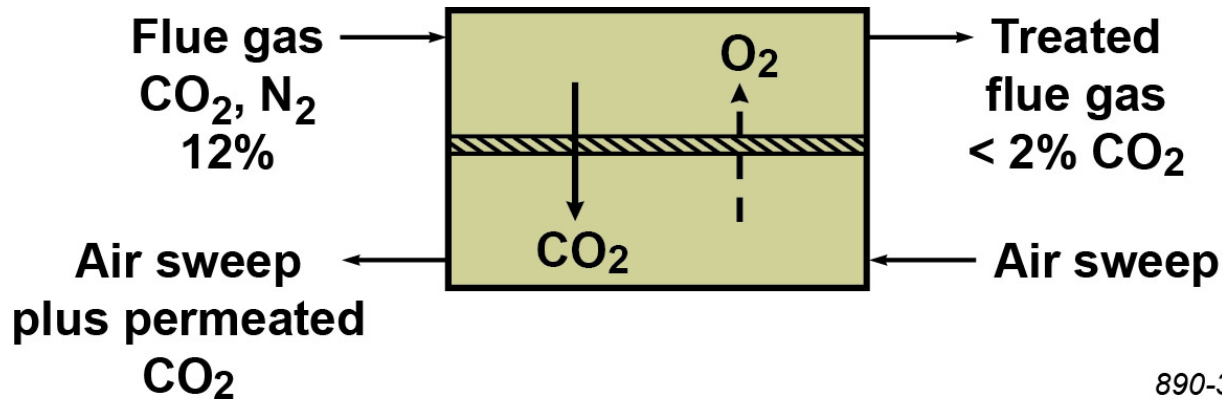


# Project Overview

- **Award name:** Low-pressure Membrane Contactors for CO<sub>2</sub> Capture
- **Project period:** 10/1/11 to 9/30/14
- **Funding:** \$ 4.0 million DOE; \$1.0 million MTR
- **DOE program manager:** Mike Mosser
- **Participants:** MTR, University of Toledo
- **Project scope:** Develop compact large membrane area (> 500 m<sup>2</sup>) low pressure drop plate-frame sweep module for CO<sub>2</sub> capture application
- **Project plan:** The key project work organized by budget period is as follows:
  - BP1 : Construct prototype laboratory modules (~ 20m<sup>2</sup>), select components, develop fabrication technology.
  - BP2: Scale up to 1m x 1m pilot scale modules (~ 100m<sup>2</sup>), demonstrate module has target performance and low pressure drop test at NCCC.
  - BP3: Scale up to full scale module (> 500 m<sup>2</sup>), show modules meet all performance targets. Be ready to test at NCCC.

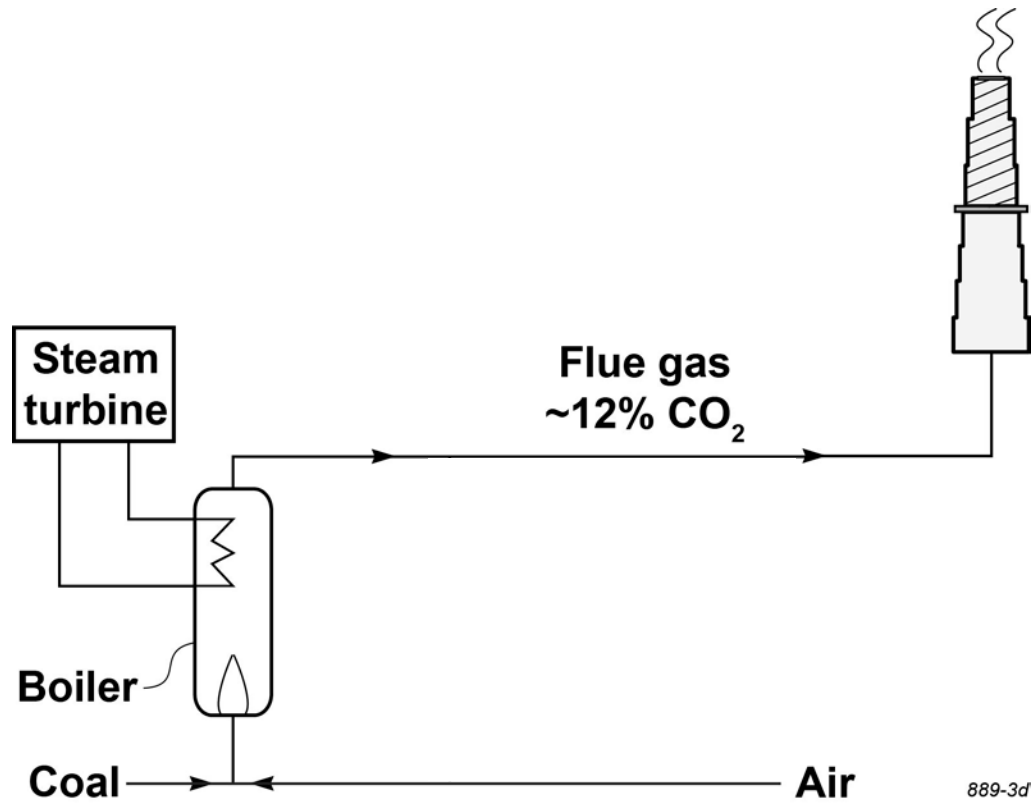
# The MTR Contactor

## *A Way of Generating an Affordable (Partial) Pressure Difference*



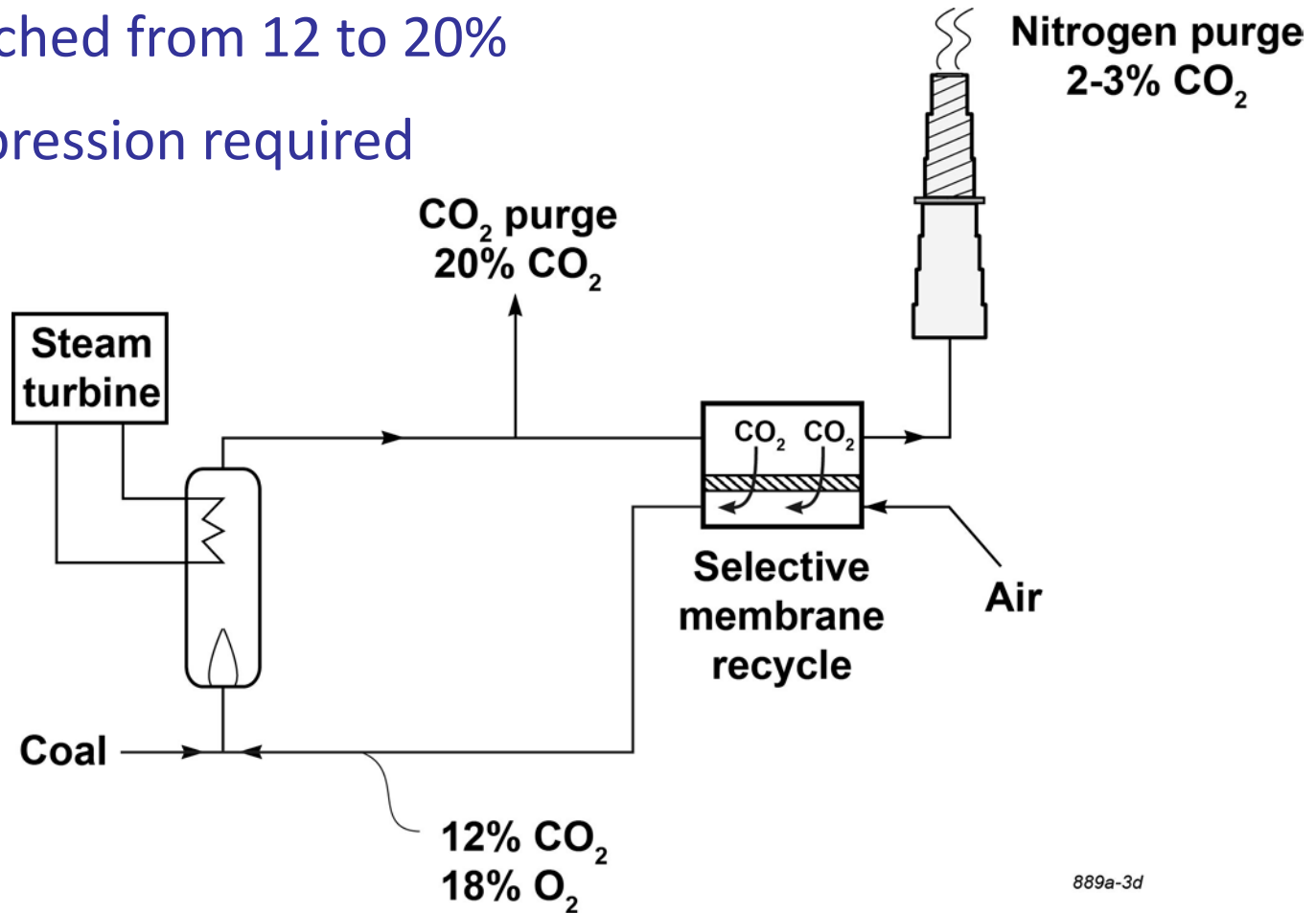
A separation is performed at no energy cost

# A Coal Power Plant



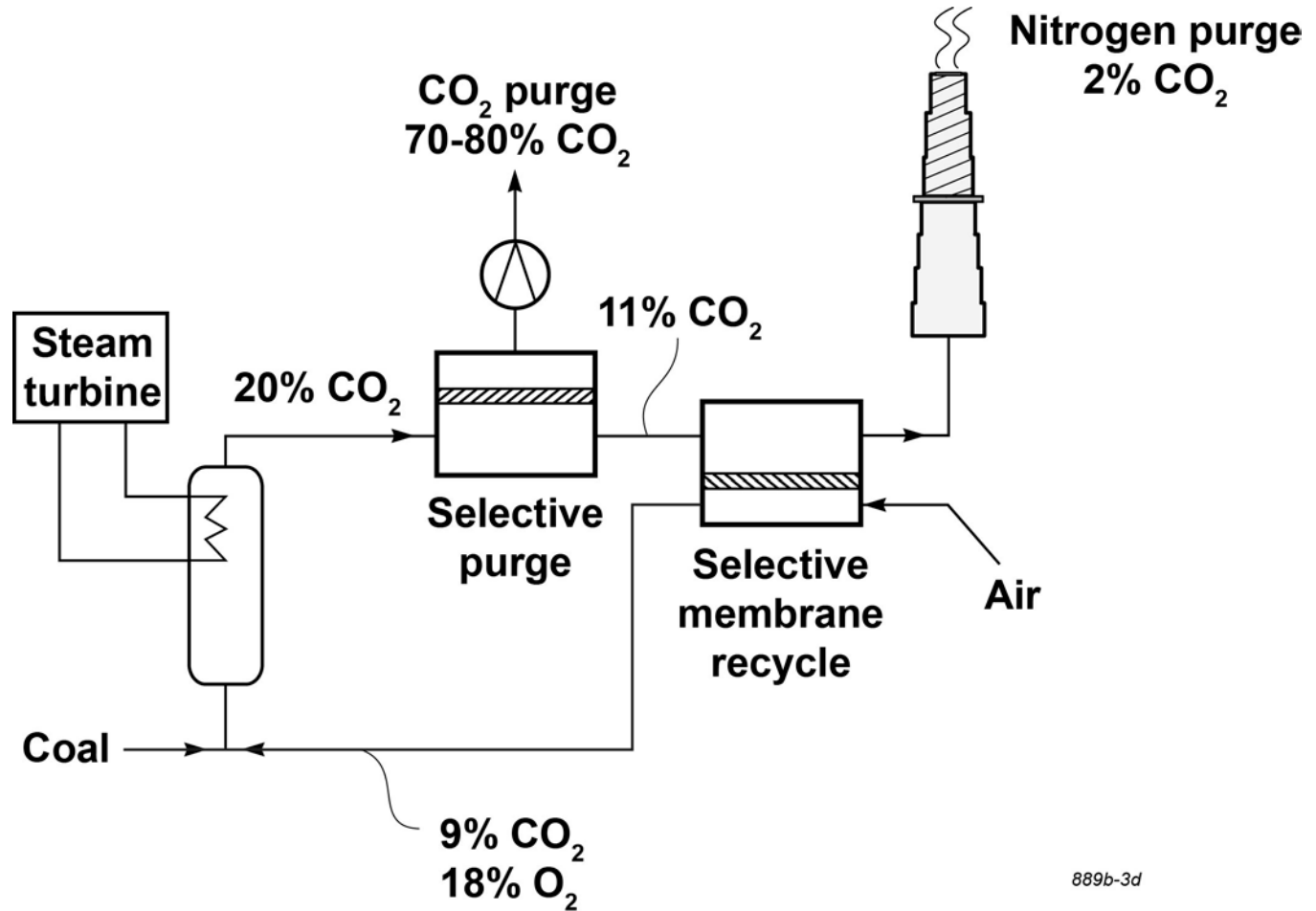
# A Coal Power Plant

- CO<sub>2</sub> enriched from 12 to 20%
- No compression required



18% O<sub>2</sub> air is OK with modern boilers

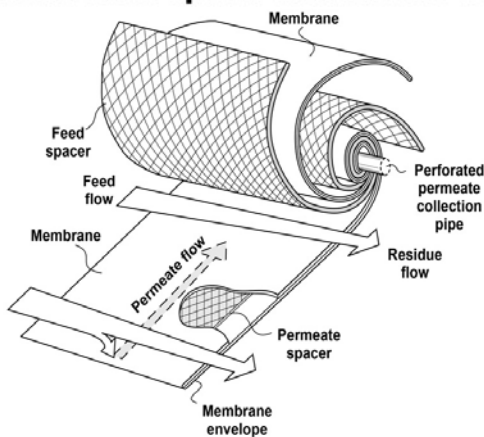
# The MTR Process



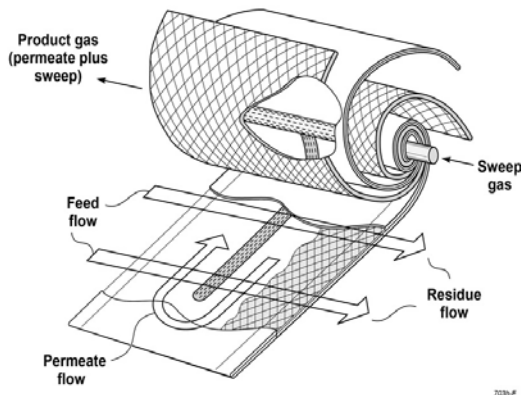
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# Current Approach Uses Modified Spiral-Wound Modules in Nested Bundles

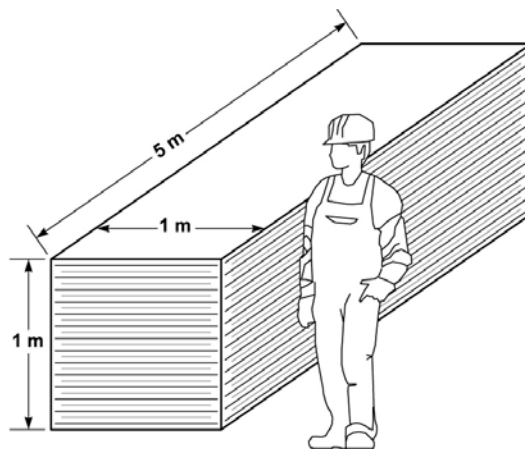
## Conventional spiral-wound module



## Spiral-wound countercurrent/sweep module



**Each module  
20 to 50 m<sup>2</sup>**

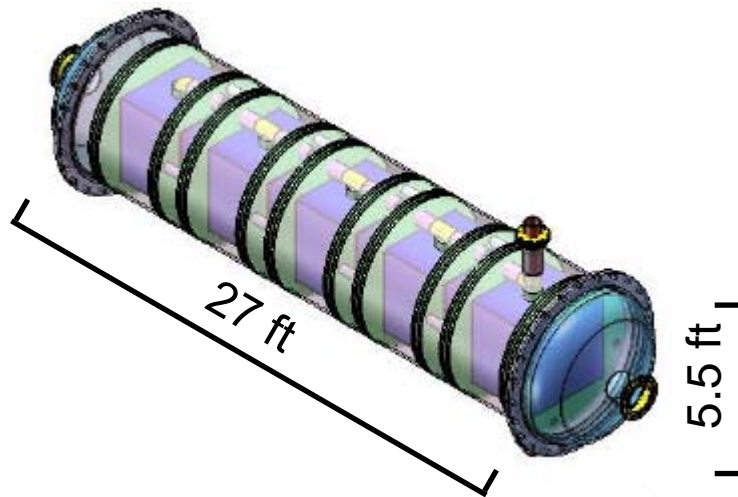


**One module skid,  
2500 m<sup>2</sup>**

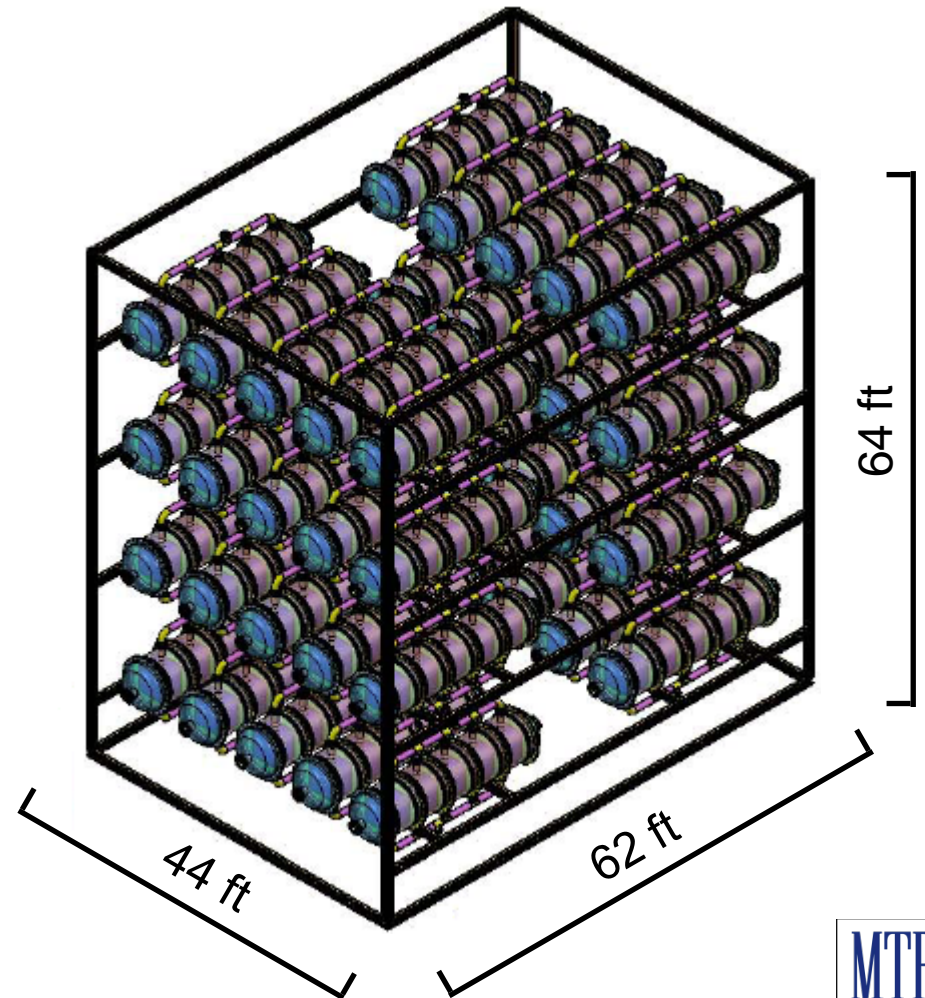


# This Project Objective

One module skid, 2500 m<sup>2</sup>



40 modules plant, 100MWe



- Smaller foot print
- Low pressure drop
- Reduced manifold
- Lower cost

# Progress to Date (First 6 Months)



- Module prototypes 2ft x 1ft x 100 sheet modules ~ 20m<sup>2</sup>
  - Selected spacer, developed sealing methods
- Models 1m x 1m x 20 sheet module
- Pressure drop looks ok
- Fabrication issue looks ok
- Scale up---working on
- Feasibility study---working on