Discover what you love to do at Air Products.

Saving the World: Engineering and Innovating for Sustainability

Presented by
Julie O’Brien
Sustainability Director
Air Products
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Engineering and Innovating for Sustainability

• What is sustainability
• Why is it important
• How we can increase sustainability
• Your role in improving sustainability

Photo source: sustainabilityadvantage.com
Air Products is...

A world-leading industrial gases company

- Supplying atmospheric and process gases and related equipment to manufacturing markets, including refining and petrochemicals, metals, electronics, food and beverage
- World’s leading supplier of helium and liquefied natural gas process technology and equipment
- Fiscal 2015 sales of $9.9 billion and current market capitalization of approximately $30 billion
- Approximately 17,000 employees in 50 countries striving to make Air Products the world’s safest and best-performing industrial gases company
- A company recognized for sustainability leadership
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What is Sustainability?
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Sustainability means...

Meeting the needs of the present and the future.
Sustainability’s “Triple Bottom Line”

- **Economic**
  - Profit, growth, cost savings, R&D

- **Social**
  - Standard of living, education, communities, equal opportunities

- **Environmental**
  - Natural resources, pollution prevention, environmental management
Population growth drives the need for sustainability

We’re already overconsuming

Source: Global Footprint Network
Earth Overshoot Day is the day on the calendar when humanity has used up the resources that it takes the planet the full year to regenerate.
We’re disrupting the earth’s cycles

Photo credit: www.usgs.gov/media/images/blue-lakes-breckenridge-colorado
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Our planet is warming

Source: NASA
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Energy and food drive GHG emissions

Impacts of warming
• Floods
• Droughts
• Extreme weather
• Ocean acidity
• Sea level rise
• Wildfires
• Insects
• Health

Source: IPCC (2014); based on global emissions from 2010

Source: US EPA
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Water availability is decreasing while use is increasing.

**Water availability**

**Embedded water**

37 gal/cup

Source: Droughtmonitor.unl.edu

129 gal/oz

Source: Waterfootprint.org
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Demands and impacts will increase with population

<table>
<thead>
<tr>
<th>2016</th>
<th>2050</th>
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<tr>
<td>7.4B People</td>
<td>9.7B People</td>
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<table>
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<tr>
<th>Energy</th>
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<tr>
<td>&gt;1.4B without access to energy</td>
<td>70% more energy</td>
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<thead>
<tr>
<th>Water</th>
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<tr>
<td>1.1B without clean drinking water; 2.6B without adequate sanitation</td>
<td>55% water consumed</td>
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<table>
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<th>Food</th>
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<tr>
<td>870MM are food insecure</td>
<td>70% food production</td>
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Sources: OECD, FAO
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Engineers to the rescue!

Improve efficiencies

Innovate

“Do it better”

“Do it different”
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Doing It Better
First law of thermodynamics: Energy can be transformed, but cannot be created or destroyed.
Doing it better means improving efficiencies

- Reduce inputs (raw materials, energy, etc.)
- Reduce wastes
- Increase outputs
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Doing it better – energy efficiency at Air Products

- 8% improvement for air plants
- 5.4% improvement for hydrogen plants
- 4 million MWH in energy
- 7 million MT CO2e
- $630 million in costs avoided
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**Doing it better – CO2 reductions at Heineken**

- Goal to reduce CO2 produced by breweries by 40% by 2020
- Gösser facility running since 1860s and making 1.4 million bottles of beer per day
- Now powered entirely by renewable and reusable energy sources
- Reduced carbon footprint of 3,000 tons CO2/year to zero

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Doing it better – water conservation by PepsiCo and Coca-Cola

- Reduced operational water use per unit of production by 26% in 2015 vs. 2006 baseline
- Saved more than $80 million 2011-2015

- Improved water efficiency by 27% since 2004
- On track to improve water efficiency by 25% from 2010 to 2020

Source: PepsiCo.com, Coca-Cola.com
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Doing it better – reducing food wastes at ConAgra Foods

423 tons of waste  200 tons of food  280 tons of food  4000 tons of waste  2069 tons of materials

Source: ConAgra Foods 2015 Citizenship Report
Reflection

- What are your sustainability impacts?
- What can you do better?
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Resource consumption of the average American

- Electricity – 30 kWh per day (household)
- CO$_2$ – 120 pounds per day
- Gasoline – >1 gallon per day
- Water – 80-100 gallons day
- Food – 5.5 pounds per day
- Waste – 4.3 pounds per day

Does not include embedded resources
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Doing It Different
Doing it different means

Changing the
• Inputs
• Process
• Outputs
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**Doing it different** – harnessing tidal energy

Scotland: 1.5 MW

Hawaii: 22 KW

Source: www.theguardian.com Source: www.futurism.com
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Doing it different – self driving cars

Photo credit: AP Photo/Gene J. Puskar
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Doing it different – hydrogen fuel cell vehicles
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Doing it different – converting CO2 to usable goods

NRG and 10xBeta
Shoe without a footprint

Newlight Technologies
“Air carbon” plastic pellets

Source: www.smithsonian.com
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Doing it different – desalination with capacitive deionization

Photo source: www.rwlwater.com
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**Doing it different – food production**

High density vertical food farming

Desert farming using only sun and seawater

Sources: urbanproduce.com, sundropfarms.com
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Doing it different – recyclable food packaging that extends shelf life

Source: DowChemical.com
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**Doing it different – circular economy**

- New opportunities for growth
- Reduces waste
- Drives resource productivity
- Helps address resource scarcity/security
- Reduces environmental impacts of production and consumption

Graphic: wrap.org.uk
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Doing It Right
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**Doing it right – Everyone has a role in sustainability**

*At school*

*At home*

*At work*

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Doing it right – company commitments to sustainability

Reporting

Ratings/Rankings

GRI Empowering Sustainable Decisions

Global Reporting Initiative

ROBECOSAM We are Sustainability Investing.

CDP Driving Sustainable Economies

FTSE4Good

FORTUNE World’s Most Admired Companies 2016

100 World’s Most Sustainable Corporations
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“Be the change you wish to see in the world” – Gandhi

- Sustainability challenges will continue to grow as population increases
- Engineers and scientists can lead the way in finding sustainable solutions
- Look for opportunities to improve sustainability
- Challenge the way things are
- Ask how you can help ensure “Enough, for all, forever”
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We invite you to join us for more inspiration, ideas and insight.
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See the newest in hydrogen-powered cars!

Booth 323 (6-8 p.m.)

- Meet our ambassadors
- Learn about careers serving the energy, environmental and emerging markets.

We will be making offers on four internships at SWE16!
Discover what you love to do at Air Products.

Join us at the Hospitality Suite 202B (8-10 p.m.)

- Meet our ambassadors
- Learn how our products and services are helping to solve some of our customers’ toughest problems
- Enter for a chance to win a tablet
- S’more station and assorted beverages
Friday, October 28th

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<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tr>
<td>11:30 – 12:30 pm</td>
<td>Tech Talk</td>
<td>PCC Hall AB, Innovation Theater</td>
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<td>Back to the Future: From Innovation to Entrepreneurship to Commercialization</td>
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<td>1:30 – 2:45 pm</td>
<td>Plenary Session</td>
<td>Room 201</td>
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<td>Management in the Age of Globalization with</td>
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<td>Marie Ffolkes, President, Industrial Gases, Americas Region</td>
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<td>2:45 – 3:45 pm</td>
<td>Presentations</td>
<td>Room 104B</td>
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<td>The Impact and Assumptions of Unconscious Biases in Your Team</td>
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<td>4:00 – 5:00 pm</td>
<td>Soaring on the Wind of Change: Transforming Organizational Chaos into Personal Order</td>
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Visit [airproducts.com/swe](http://airproducts.com/swe) for presentation and handout materials.
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Booth 323 (9:30 a.m. - 4 p.m.)

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Thank you
tell me more
airproducts.com/swe