



The *Vectors* that Affect Us

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Plastics, and Hydrocarbons



38th Annual Blow Molding Conference, October 23-25, 2023

Chicago (Wheeling), IL

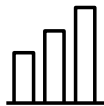
What are the vectors that affect us?



The Freeport Facts – March 7th, 1940



This is Dow, Today



2022 NET SALES

\$57B



EMPLOYEES

~37,800



MANUFACTURING SITES

104 sites



GLOBAL REACH

31 countries

in which Dow manufactures products

Complexity

**4,000
Products**

**28,000
SKUs**

**14,000
Customers**

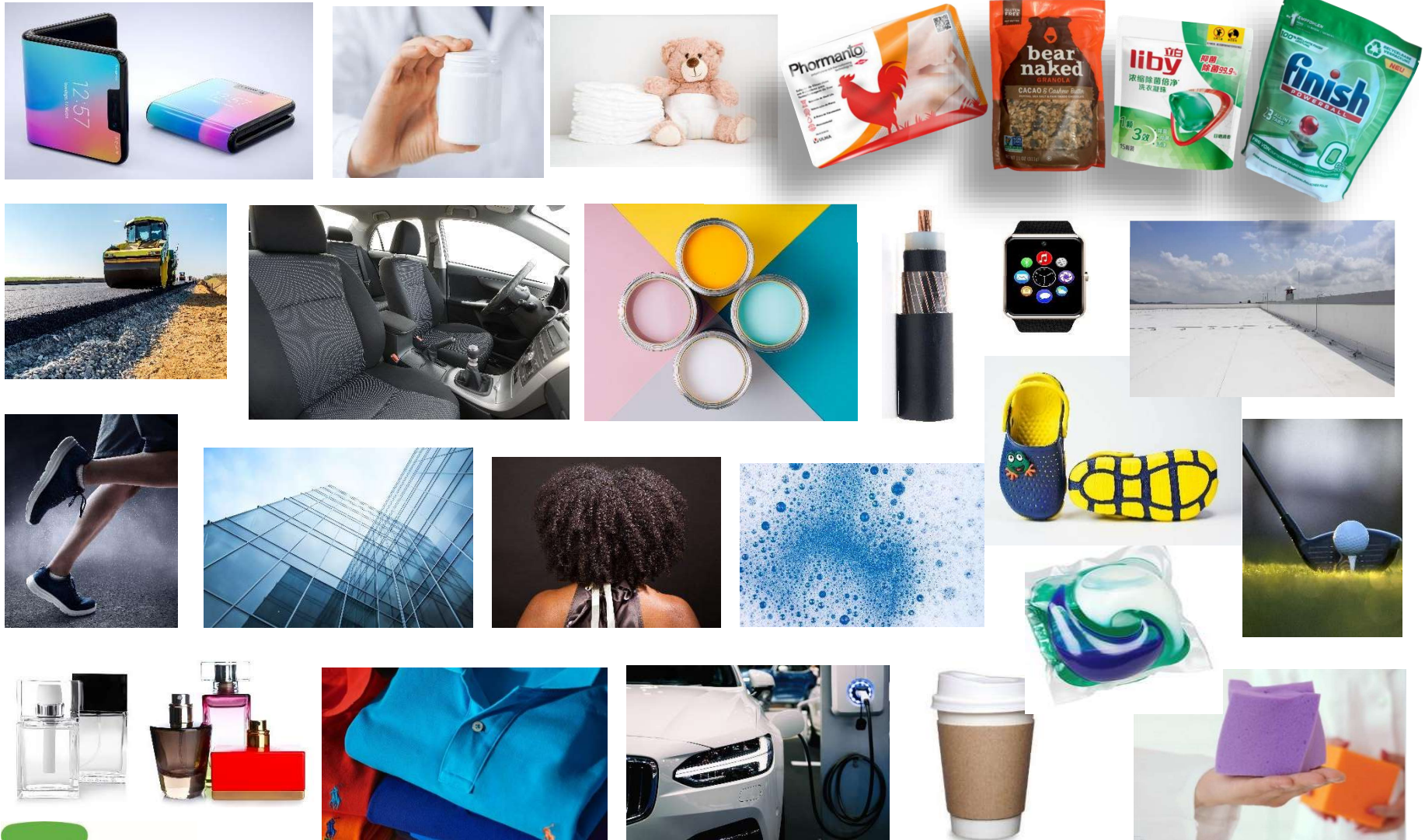


**45,000
Customer
Locations**

**In 170
countries**



Snapshot of Dow Products

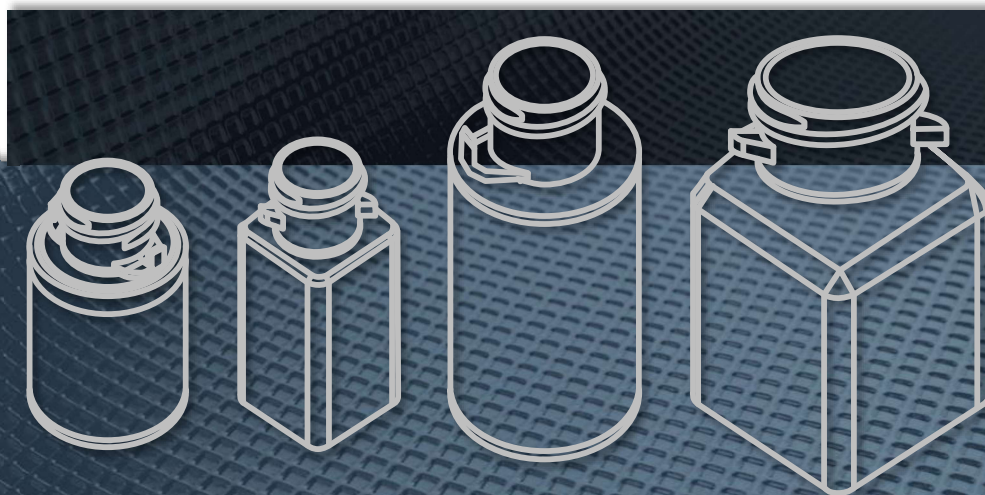


Innovation Continues...

CONTINUUM™ 6620 HEALTH+™ Bimodal Polyethylene Resin

Enables:

- 20-25% bottle weight reduction
- 21-33% cycle time reduction
- 21-30% lower moisture vapor transmission rate (MVTR)
- Mono-layer bottle design
- 100% recyclable bottles



Typical values, not to be construed as specifications. Users should confirm results by their own tests.



An Industry with Impact

THE CHEMICAL
INDUSTRY IS THE
5TH LARGEST
MANUFACTURING SECTOR

120 
MILLION JOBS

ARE SUPPORTED BY THE
GLOBAL CHEMICAL INDUSTRY

*equivalent to the
population of Mexico*

**\$5.7
TRILLION**
SUPPORTED IN
GROSS VALUE ADDED

*equivalent to 7% of global GDP
(or equivalent to the combined GDPs
of India, Brazil, and Mexico)*



\$51 BILLION
IN GLOBAL CHEMISTRY R&D
INVESTMENT
IN 2017



CHEMICAL
MANUFACTURING IS
**HIGHLY
PRODUCTIVE**
WITH
\$75,000
GVA PRODUCED BY
EACH EMPLOYEE



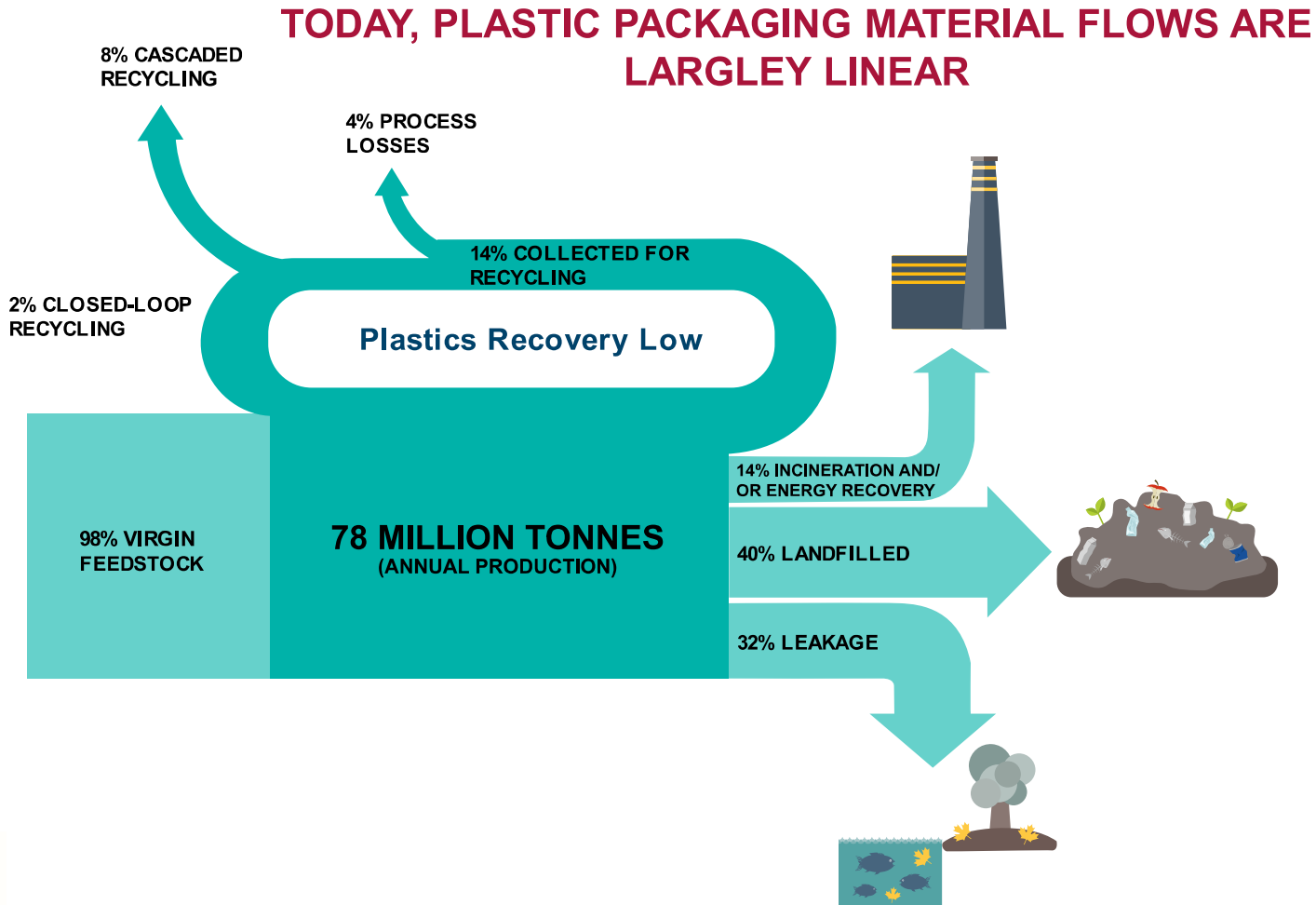
FOR EACH JOB
IN THE CHEMICAL INDUSTRY,

7 

ADDITIONAL JOBS ARE
CREATED ELSEWHERE
IN THE ECONOMY

A New Challenge Emerges: Circular Solutions

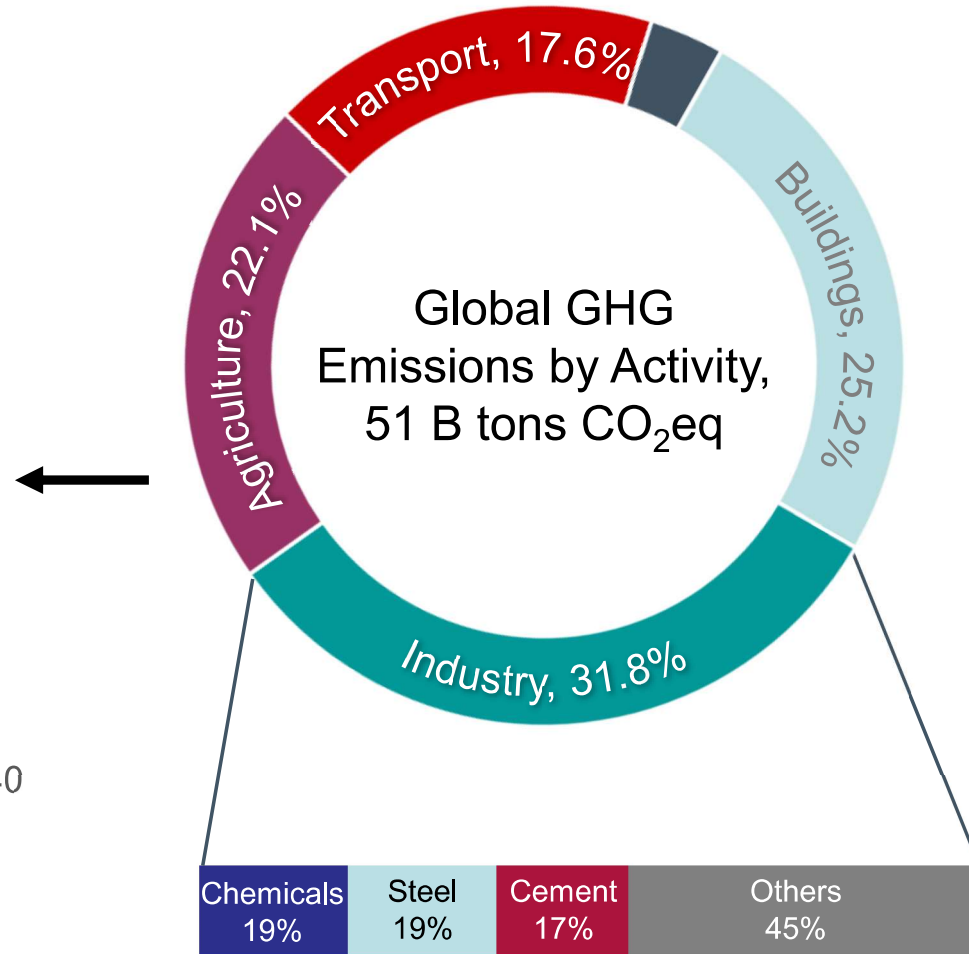
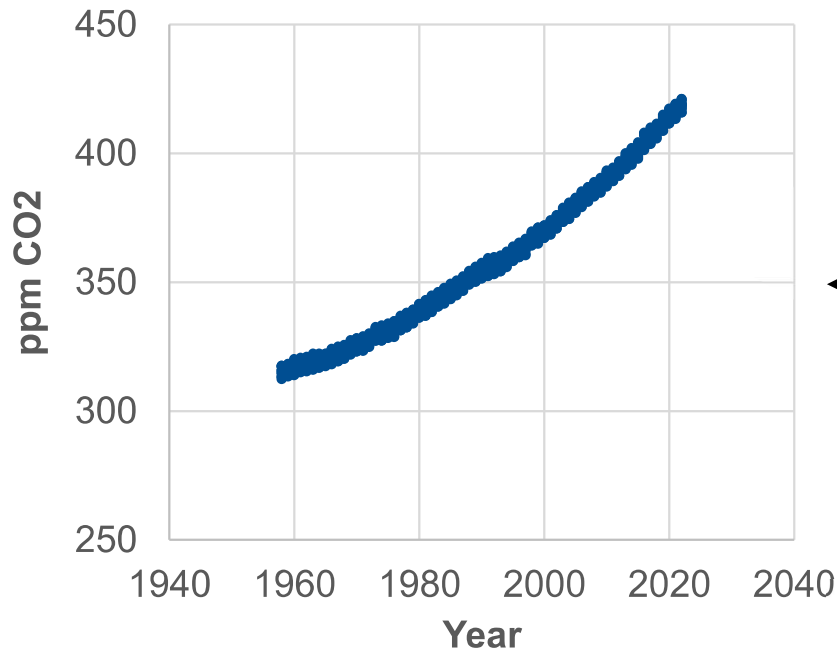
Sustainability →



A New Challenge Emerges: GHG Emissions


Sustainability

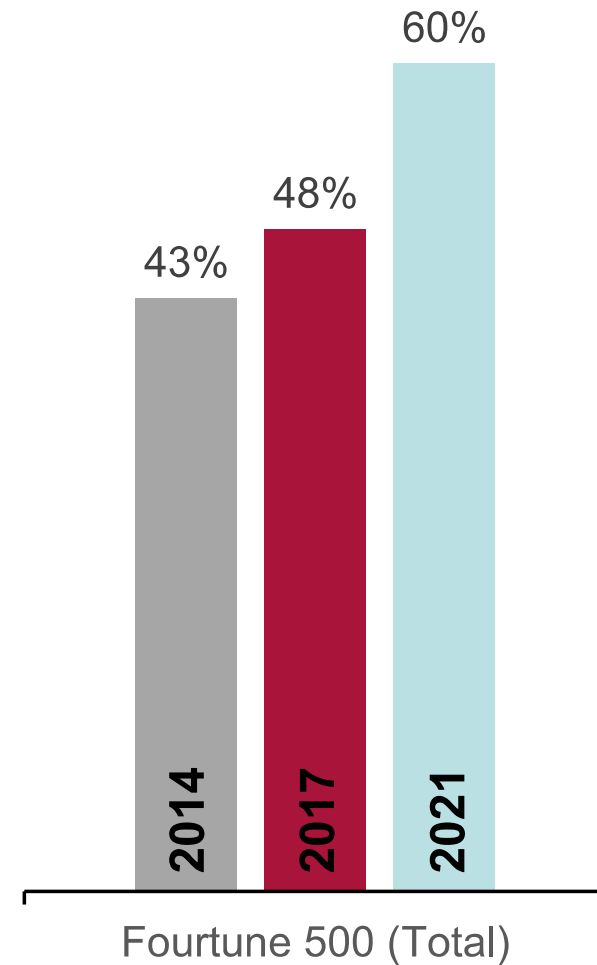
NASA CO₂ in Atmosphere



An Industry – Rising to the Challenge

Fortune 500 Companies are Setting Goals

- 60% of Companies have ≥ 1 GHG emissions reduction target
 - +12 pt vs 2017
- ~80% of Materials companies have targets
- Only 17% of Fortune 500 Companies have a net-zero or carbon neutrality target
- 40% have no targets



Rise to The Challenge – Dow's Corporate Goals



PROTECT THE CLIMATE

By 2030, Dow will reduce its net annual carbon emissions by 5 million metric tons vs. its 2020 baseline* (15% reduction). By 2050, Dow intends to be **carbon neutral** (Scope 1 + 2 + 3 plus product benefits).



Delivering **low-carbon products and technologies**



TRANSFORM THE WASTE

By 2030, Dow will transform plastic waste and other forms of alternative feedstock to commercialize **3 million metric tons** of circular and renewable solutions annually.



Scaling **Circular** (Mechanical and Advanced Recycling) & **Renewable** (Bio-based) Solutions



CLOSE THE LOOP

By 2035, Dow will “close the loop” by enabling 100% of Dow products sold into packaging applications to be **reusable or recyclable**.



Helping our customers and brand owners **redesign** and **create** packaging solutions that are both high-performing and recyclable

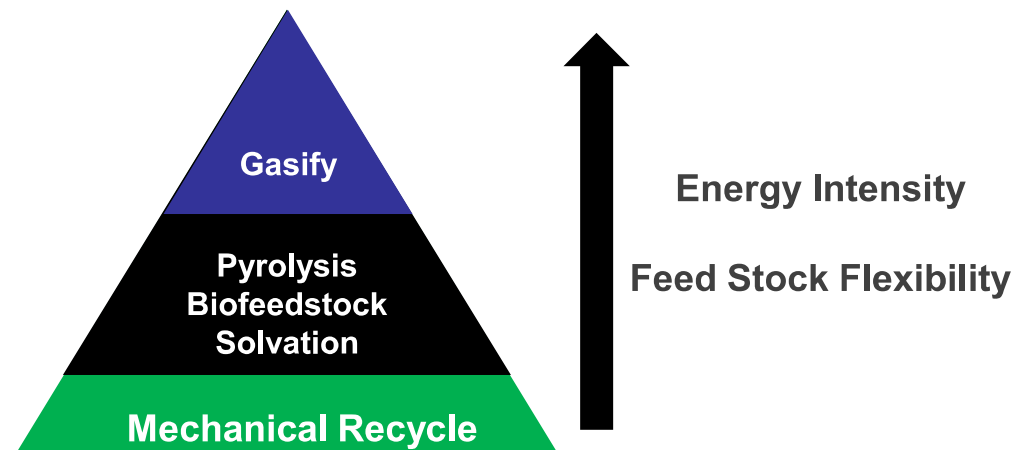
New Offerings to Customers

By 2050 we plan to be carbon neutral

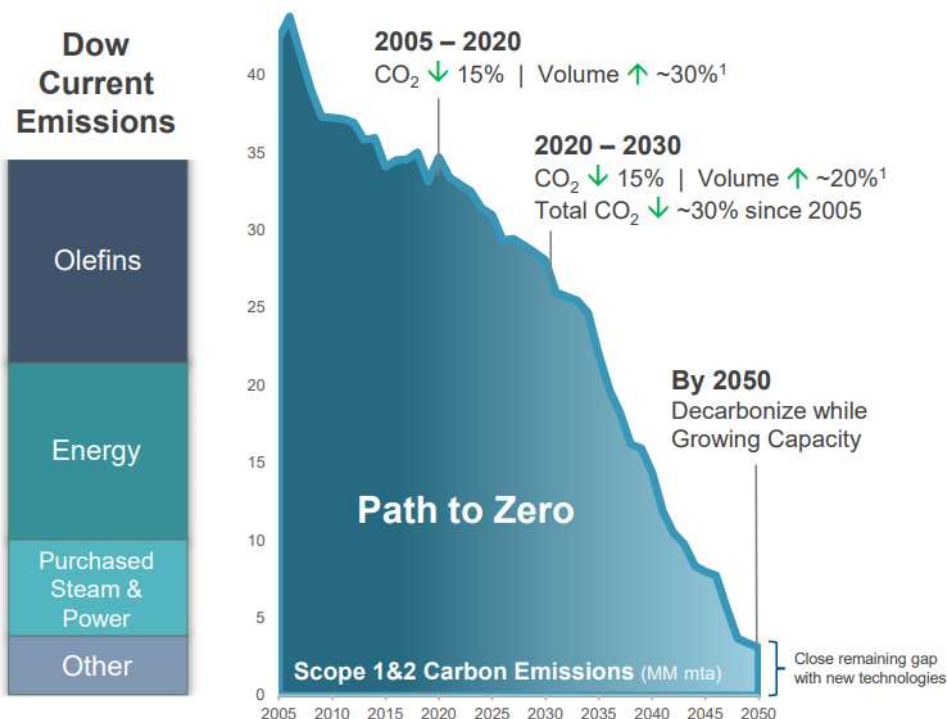
If this were all P&SP 3 million metric tons = 30% of Volume

Are our goals in conflict ?
Can they be achieved at the same time ?

Setting Strategy & Taking Actions



A Clear Path to Decarbonize & Grow



Phased Strategy to Decarbonize and Grow

- New Net Zero Crackers – Canada, Netherlands
- **Scale Carbon Efficient Cracker – FCDH / EDH**
- **Green Technologies – Nuclear / E-Cracking**

Process Research at Dow

- High Throughput Catalytic Research
- Piloting Capabilities
- Process Intensification
- Analytical Characterization
- Advanced Process Modeling
- Automated Carbon Footprint Analysis



Dow, X-energy to drive carbon emissions reductions through deployment of advanced small modular nuclear power

Aug. 9, 2022 Dow announces first grid-scale advanced nuclear reactor, part of U.S. DOE's Advanced Reactor Demonstration Program, will serve as a blueprint for reducing carbon emissions



Innovation to Transform the Waste

Nov. 15, 2022 -- Dow and WM collaborate to expand curbside film

collection & recycle



Revoloop

recycled plastics resins by



RECYCLE READY TECHNOLOGY
for store drop-off recycling

Design for Recyclability

Dow, Berry Global, and Kashi collaborate to enable fully recyclable packaging structure

Shelf-Life – Aesthetics – Seal – Fast Line-Speed



Jan. 25, 2023 -- Dow and LVMH collaborate to accelerate use of **bio and circular sustainable packaging**, maintaining brilliant aesthetics and design freedom

Largest of its kind



Sept. 14, 2022 -- Dow & Mura partner to advance circularity and enable up to **600 KTA** advanced recycling capacity by 2030



Collaboration Enables Sustainable Evolution

Building an Industrial Ecosystem

- Founding member of the **Alliance to End Plastic Waste**
- Established the **Closed Loop Circular Plastics Fund**
- Scaling advanced recycling with **Mura Technology**
- Developed disruptive PCR PE film solutions with **Circulate Capital**
- Fuenix Ecogy Group, Gunvor** and **New Hope Energy** partnerships to source pyrolysis oil
- Invested in **Mr. Green Africa** to scale solutions to reuse waste
- Valoregen** to build the largest hybrid recycling site in France
- Nine of Dow's largest sites received **ISCC Plus recognition** related to tracking sustainable feedstock use
- Dow and **X-energy** to bring low carbon small modular nuclear reactor technology to TX plant



CIRCULATE CAPITAL



MR. GREEN AFRICA



INTERNATIONAL SUSTAINABILITY
IN CARBON CERTIFICATION



Delivering Innovative Solutions

- REVOLOOP™** Post-Consumer Recycled Resins for flexible or rigid packaging applications
- SURLYN™ CIR and REN** Circular and bio-based cosmetic packaging solutions with glass-like aesthetic and freedom of design
- AFFINITY™ REN** Bio-Based High-Performance Polyolefin Elastomers
- ENGAGE™ REN** for low-carbon emission footwear
- RENUVA™** Program converts used mattresses into raw materials
- Automotive waste turns into new car products with **SPECFLEX™ C & VORANOL™ C** foam systems
- AMPLIFY™ SI** Silicone Enhanced Polymer System increases use of recycled plastic from 70% to 90%
- RHOBARR™** Dispersions improve recyclability for coated paper products
- ECOSURF™ EH** Readily Biodegradable Surfactants



Meeting Increasing Brand-Owner Demand

Dow technology to support **Crocs®** in reducing the CO₂ impact in manufacturing process



Kellogg's® Kashi Bear Naked brand to roll out fully recyclable packaging, enabled by Dow RecycleReady Technology

Dow and **Sport Singapore** upcycle shoes into sports infrastructure using **ECOGROUND™** Binders



Liby® and Dow introduce China's first fully recyclable laundry packaging

Commercialized **recyclable toothpaste tubes** used by major consumer brands



SiLASTIC™ Self-Sealing Silicone enables **Bridgestone® B-SEALS**, a recyclable, silicone-based tire sealant technology

Dow, Alico, and Sello Rojo create **100% recyclable coffee packaging** with reduced carbon footprint



Expanded sustainability targets & accelerated delivery with new circular & renewable business platform

Digitalization is changing the world



“Digitalization is...

...too time consuming and expensive to keep systems updated

...labor intensive to convert & harmonize data structures

...taking longer to do the same things vs the practices in place

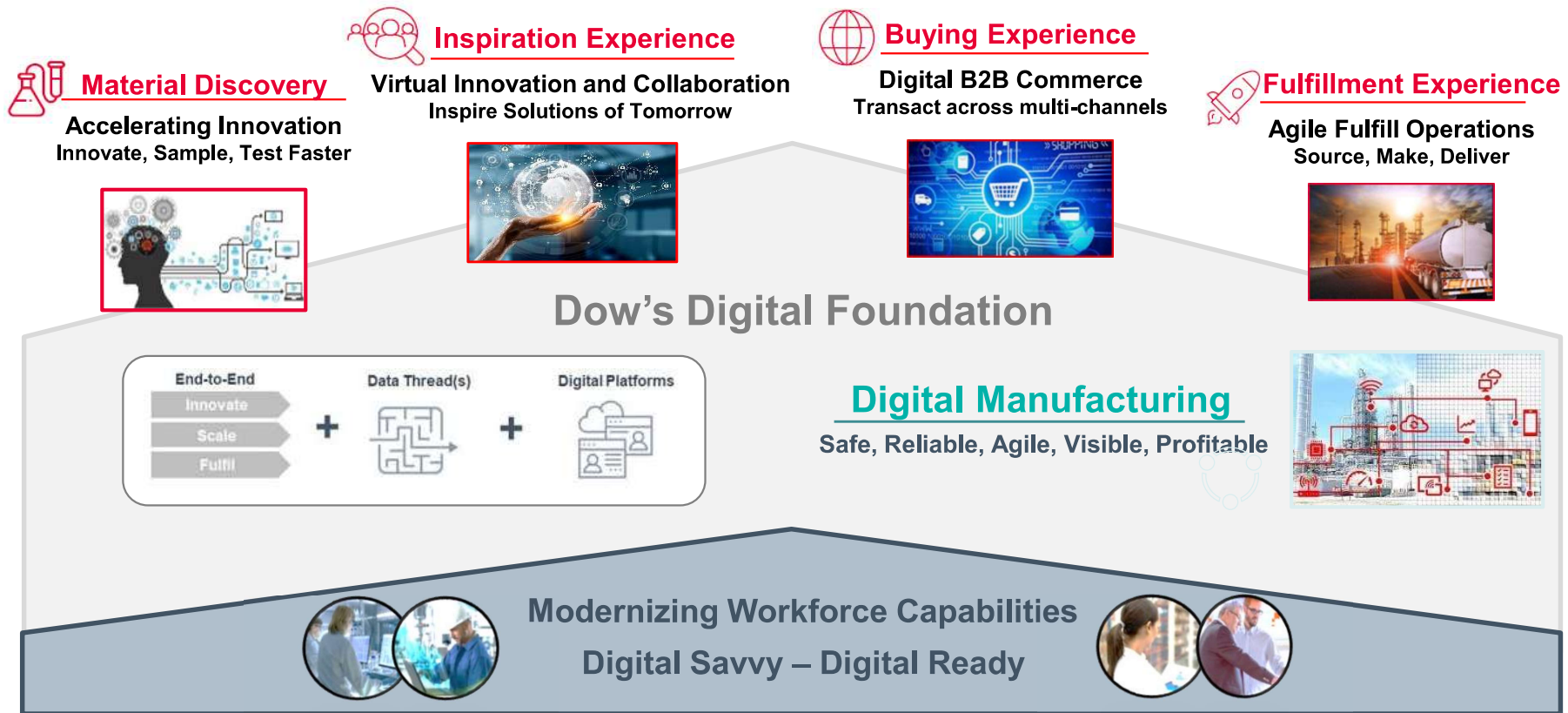
...handled by another function (not my problem!)

...creates new, unnecessary risks

...***an opportunity*** to innovate faster, monetize historic data/information/knowledge, introduce new skills and thought processes into teams, monetize data and information on hand, create a competitive advantage

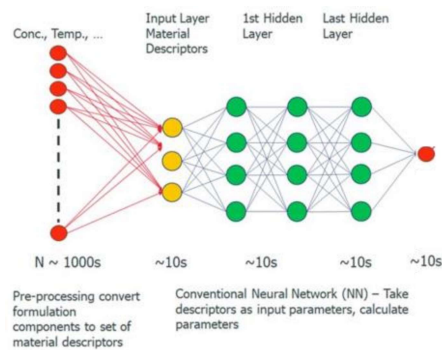
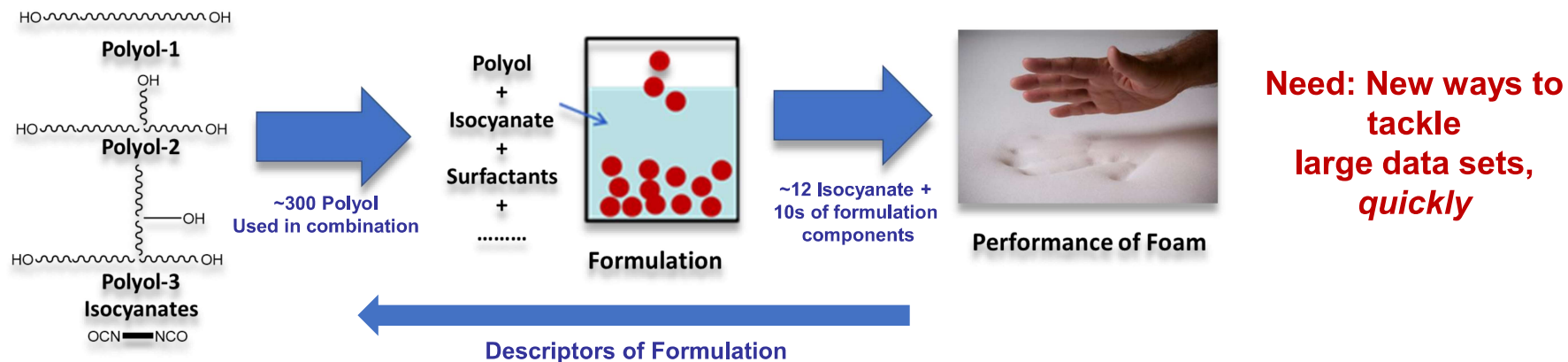
Accelerating through Digital Breakthroughs

Engage and Inspire Customers. Empower Employees. Accelerate Value Creation.

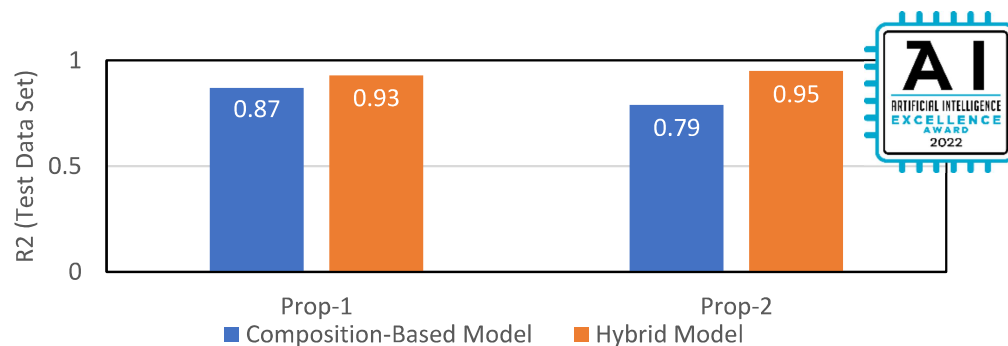


Don't Run! AI/ML Enhance Innovation

PREDICTING FOAM PERFORMANCE FROM COMPONENTS



**AI Theory Based Neural
Nets**



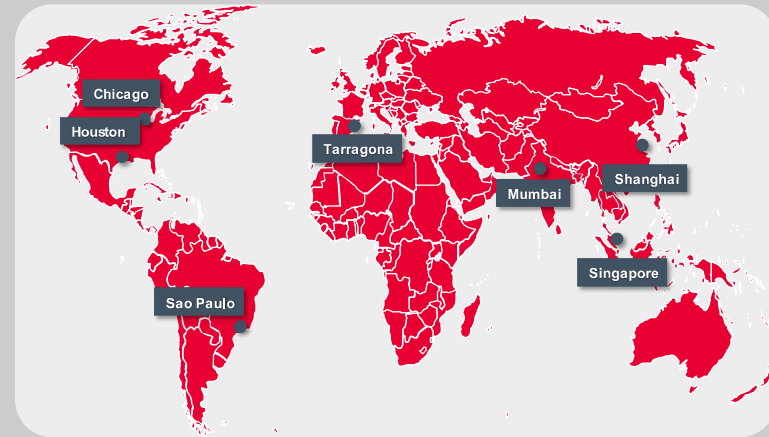
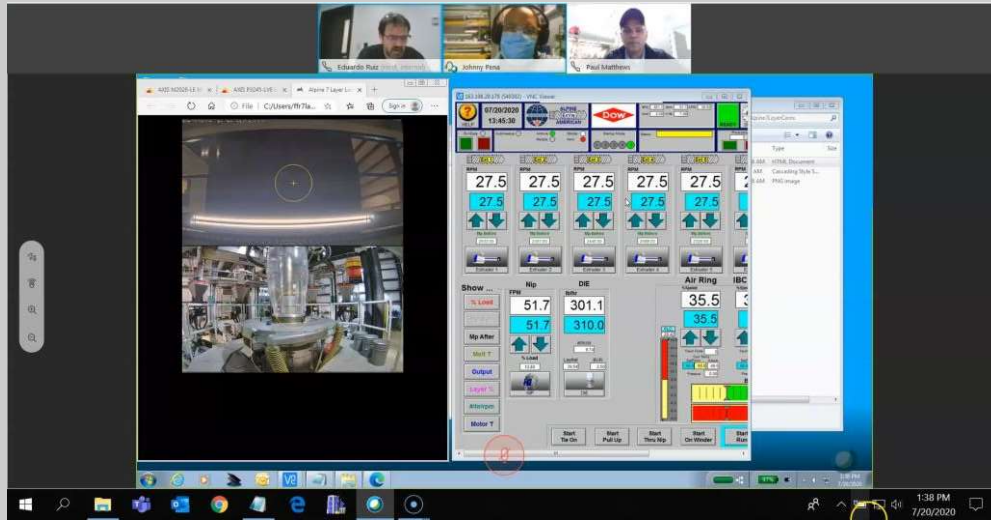
Dow ML models resulted in high accuracy

<https://www.bintelligence.com/artificial-intelligence-excellence-awards>

Embracing Digital Tools to Grow

Pack Studios Live – Collaborate from Anywhere

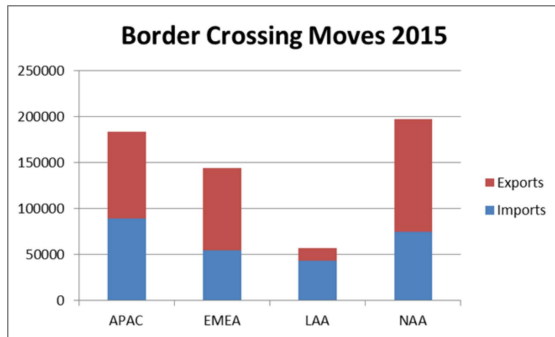
Join us to conduct trials virtually...



With your whole team.

Dow's Digital Fulfillment Center

MACHINE LEARNING FOR CLASSIFYING CROSS-BORDER SHIPMENTS



Harmonized Tariff Schedule

Each shipment must be classified
(by composition, properties, etc.)

- 3902 Polymers of propylene or of other olefins.
 - 3902100000 Polypropylene
 - 390220 Polyisobutylene:
 - 3902201000 Elastomeric
 - 3902205000 Other
 - 3902300000 Propylene copolymers



Custom
declaration



Free trade
agreements

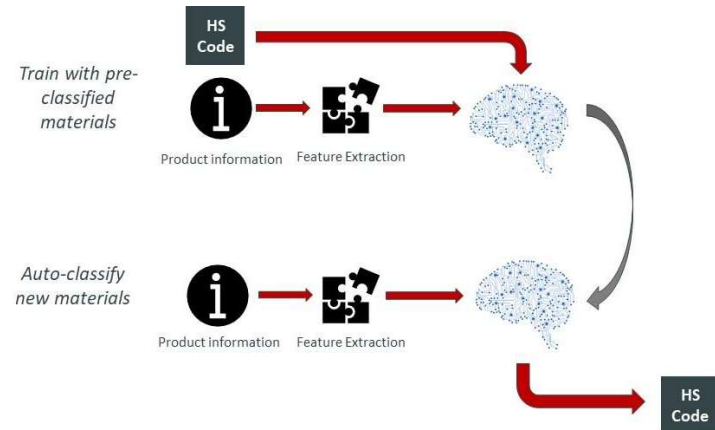


Dangerous
goods



Duty
& tariff

- Trade compliance is critical for our customers
- Goods classification is critical for trade compliance



- Trained agent deployed in the cloud
- Random Forest Classifier utilized
- Tree-based model enables decision documentation
 - Supports customs auditing
 - Provides interpretation

Growing and Nurturing your Digital Workforce

Creation of R&D Digital Fellows

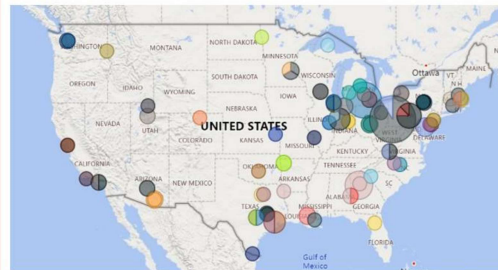


Leading technology advancement in hybrid modeling and data science, digital implementation strategy, and foster data analytics talent development

Internship

2023 Advanced Degree Internships for Science & Engineering (ADISE)

- To date **159 total candidates** have applied ADISE 2023
 - >100 Ph.D.
 - >50 M.S.
- **Candidate pool represents 68 universities in 31 states**
 - 2/3 of candidates from strategic universities



Diversity

Data Analytics for Science Immersion Experience (DASIE)

There is a widespread need for scientists with advanced data skills and a national need to recruit and retain emerging scientists from underrepresented groups.

DASIE, in partnership with Dow and Accenture, addresses this skills gap by bringing together students from outside of Carnegie Mellon University to start building a pipeline of future science leaders with advanced data skills and to bring awareness of opportunities that exist at CMU, the partner organizations and the industry as a whole.

Participants will spend one week on campus at CMU, experiencing some of the curriculum relating to Data Analytics, and then travel to Midland, MI for hands-on experiences at Global Dow Center. In addition to their time in the classroom, there will be many opportunities for connection, including on-the-job shadowing and training from Dow and Accenture industry experts and mentoring from CMU faculty and staff.



Big Challenges Require (a lot of) Novel Ideas

Inclusion, Equity, and Diversity

Attracting Diverse Talent

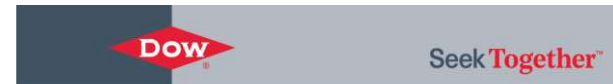


The DOW **BEST** Symposium
The DOW **Diamond** Symposium

Engaging Diverse Talent



Cross Fertilization of Fellows



People News

Shaun Ahn, Kaoru Aou, Wei Gao, and Jerzy Klosin to join Global Packaging and Specialty Plastics and Hydrocarbons R&D Leadership Team

Continuing with our inclusive culture in PSP&H R&D, we thrive by partnering with other teams in Dow to develop our people AND to drive new ideas and innovation.

Inclusion & Diversity KPIs

2017		2022	YoY
15.1%	GLOBAL ERG PARTICIPATION	57.3%	↑
68%	OVERALL EMPLOYEE SATISFACTION	73%	↑
27.4%	GLOBAL REPRESENTATION OF WOMEN	29.5%	↑
21.9%	U.S. ETHNIC MINORITY REPRESENTATION	27.5%	↑
Begin yearly goals	U.S. SUPPLIER DIVERSITY SPEND - \$500 MM BY 2025	\$275 MM vs \$245 MM goal	↑

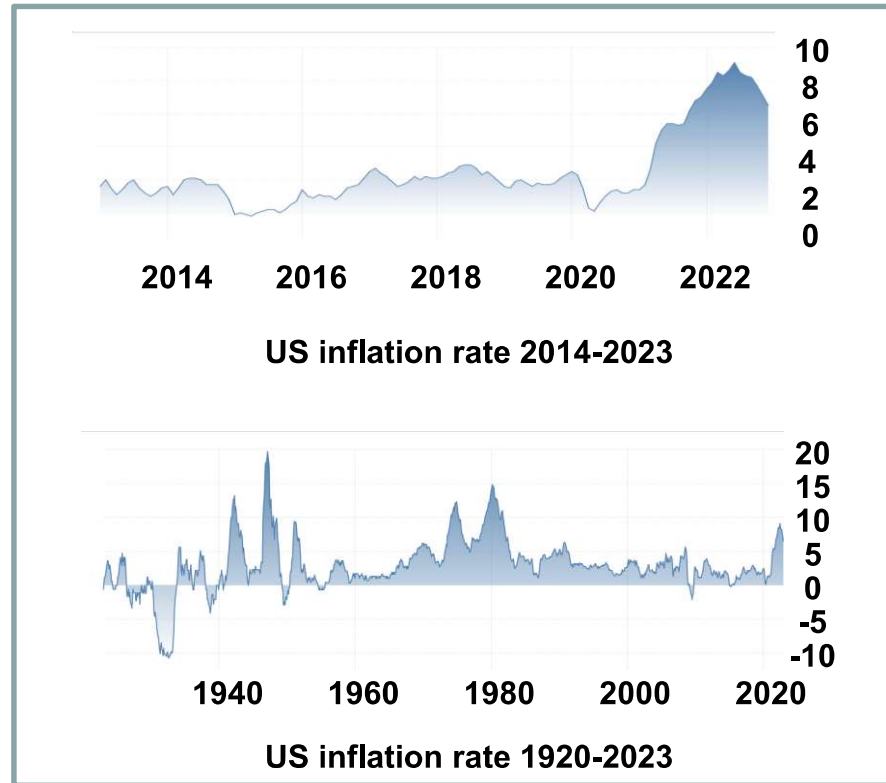
The only certainty is uncertainty

Economic Uncertainty

There will continue to be ups and downs...



*“Only when the tide goes **out** do you discover who’s been swimming naked.”*

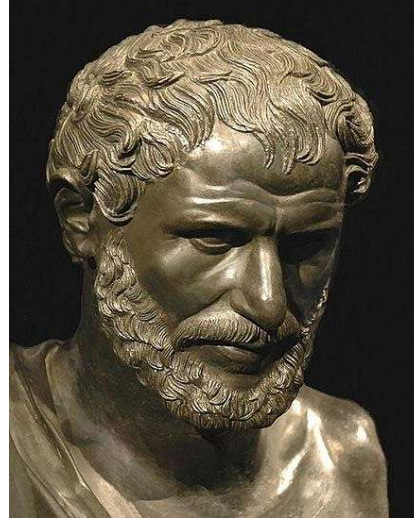


How will our industry respond?

Now is our time to build



The Freeport Facts – March 7th, 1940



Heraclitus of Ephesus
(530-470 BC)

His central claim is summed up in the phrase
Panta Rhei ("life is flux")
recognizing the essential, underlying essence of life as change.

Nothing in life is permanent, nor can it be, because the very nature of existence is change.



Seek

Together™