BlowMoulding

Moving Forward, by Your Side

Reduction in Carbon Footprints & Advancements in Large Blow Molding Equipment

A few words about ourselves

ST BlowMoulding

- Manufactures large Blow Molding equipment since 1980
- Experts in accumulator head technologies, and continuous extrusion for industrial packaging
- More than 500 machines installed around the world

Aleksandr Kharazov

- 5 years in plastics industry
- Working with ST since 2022
- Covers US and Canada markets

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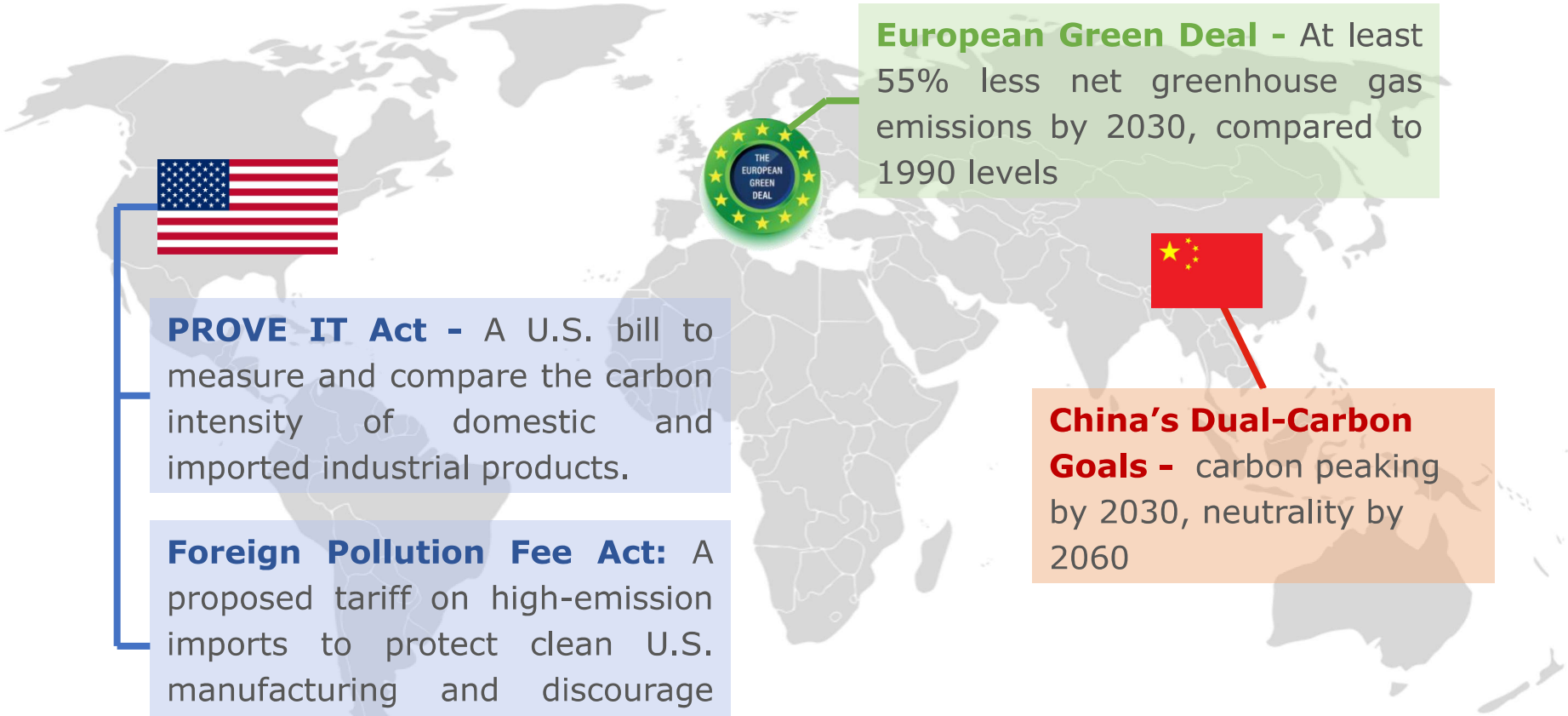
Environmental Pressure and Market Demands

The importance of sustainable technologies in Blow Molding

Environmental Pressure and Market Demands

Environmental Pressure Is Global—and Unrelenting

Global policy is catching up to us:



European Green Deal - At least 55% less net greenhouse gas emissions by 2030, compared to 1990 levels

PROVE IT Act - A U.S. bill to measure and compare the carbon intensity of domestic and imported industrial products.

Foreign Pollution Fee Act: A proposed tariff on high-emission imports to protect clean U.S. manufacturing and discourage carbon dumping.

China's Dual-Carbon Goals - carbon peaking by 2030, neutrality by 2060

Environmental Pressure and Market Demands

Even under the current Republican-led administration, clean manufacturing remains a strategic goal—though framed differently.

"Let's bring manufacturing home and reward those who make it cleaner"
— *Vice President J.D. Vance*, July 2025 speech

"This bill calls out the foreign polluters and rewards American businesses who are doing the right thing."
— Sen. Lindsey Graham, describing how clean U.S. manufacturing is advantaged

"United States industries don't get enough credit… from 2005 to 2020, this country reduced emissions more than any place else in the world."
— Sen. Bob Latta Interview highlighting manufacturing & emissions mix, June 2025

Environmental Pressure and Market Demands

"The market is driving this harder than policy."
— Larry Fink, CEO of BlackRock

Major blow-molded packaging users—have all pledged carbon neutrality by 2040 or earlier

Require tier-one suppliers to report and reduce embedded carbon in all parts—including blow-molded fuel and fluid tanks by 2040 or earlier

In procurement tenders, low-carbon scores are now winning deals in industries like personal care, agriculture, and logistics.

Environmental Pressure and Market Demands

What Happens If We Ignore It?

Loss of global customers demanding lower carbon packaging

Tariffs or carbon penalties on exported parts to Europe and Asia.

Higher long-term costs due to outdated energy systems and materials.

Lagging reputation among talent, investors, and partners.

02
Understanding Carbon Footprint in Blow Molding

Key Contributors and Typical Emission Metrics

Understanding Carbon Footprint in Blow Molding

Definition of Carbon Footprint

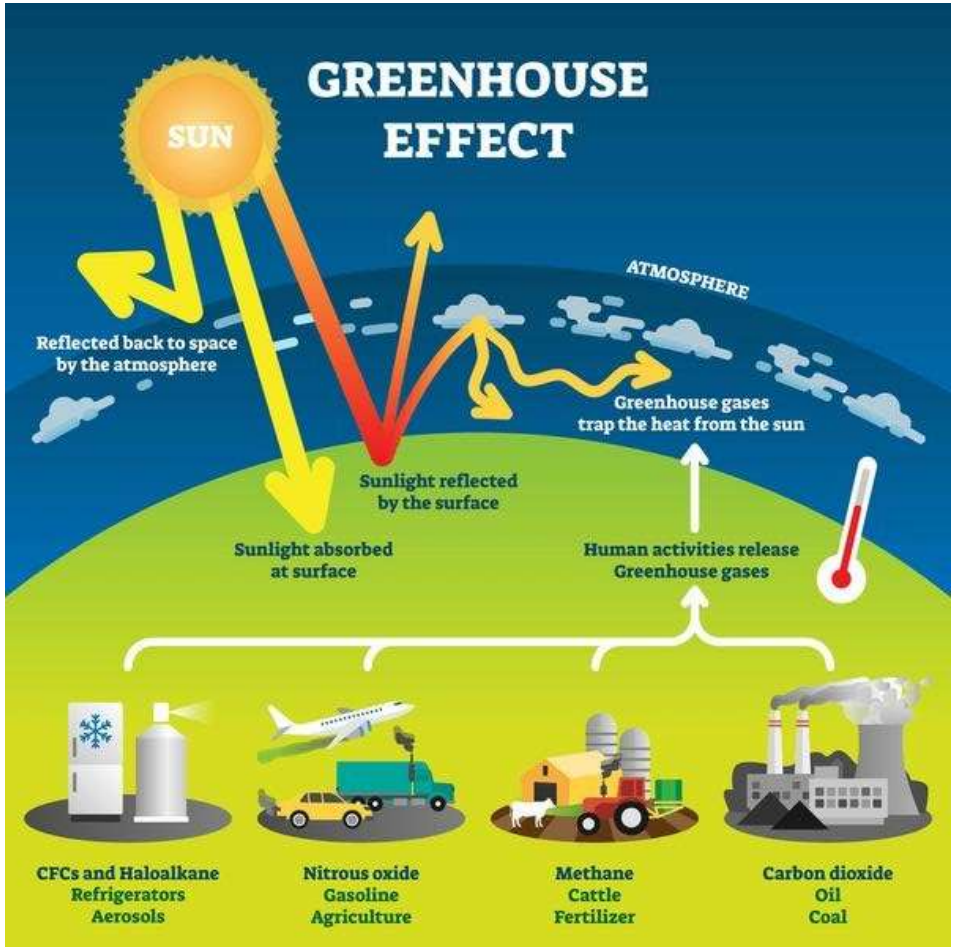
«Carbon Footprint» is the total amount of greenhouse gases emissions (GHG) caused by an individual, organization, event, service or product – expressed as carbon dioxyde (CO_2) equivalent.

Direct Emissions

Indirect Emissions

Understanding Carbon Footprint in Blow Molding

CO_2 traps heat in the atmosphere, leading to rising global temperatures.



Understanding Carbon Footprint in Blow Molding

Gases like carbon dioxide (CO_2), methane (CH_4), and water vapor (H_2O) trap some of this outgoing infrared radiation in the atmosphere.

Why CO_2 Matters Most:

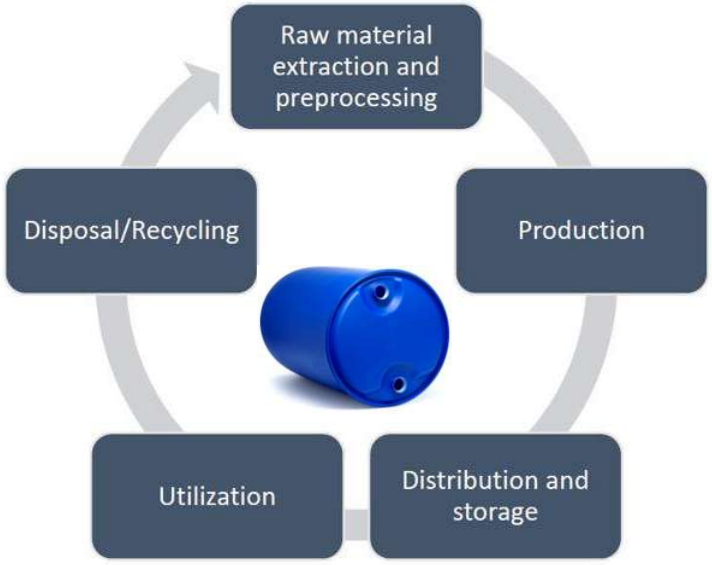
- CO_2 is long-lived in the atmosphere (hundreds of years).
- It makes up the largest share of human-caused emissions.
- Even small increases in CO_2 have a big cumulative effect.

- Extreme Weather Events
- Decreasing air quality
- Rising Global Temperatures
- Sea Level Rise
- Ecosystem Disruption
- Water Scarcity and Crop Failures

Understanding Carbon Footprint in Blow Molding

Key Contributors

It is difficult to calculate the Carbon Footprint of the entire lifecycle of a product (LCA – Life Cycle Assessment "**from cradle to grave**") because of inadequate knowledge of data about all contributing processes.



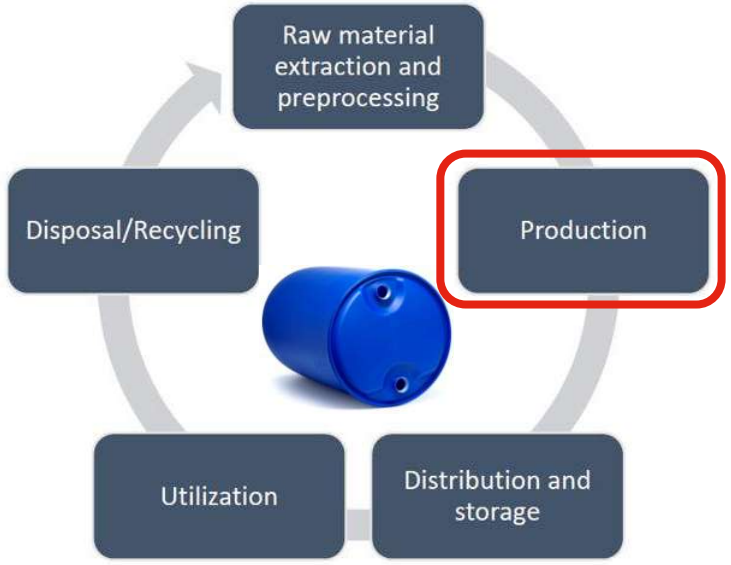
Understanding Carbon Footprint in Blow Molding

Key Contributors

For the blow moulders the only step of interest is the **production of the plastic item**, because it is the only step under control

There are three major factors affecting the Carbon Footprint in the production step:

- **Energy consumption**
- **Raw Material consumption**
- **Auxiliary Emissions**



Understanding Carbon Footprint in Blow Molding

How to Calculate Total CO_2 Emissions in Blow Molding

Basic formula of total **CO_2** emissions:

MATERIAL EMISSIONS	ENERGY EMISSIONS	AUXILIARY EMISSIONS
Resin Mass (**lbs**) x Emission factor **(lbs CO2e/lb)**	Energy consumed (**kWh**) x Electricity emission factor **(lbs CO2e/kWh)**	- Compressed air - Chillers - Internal logistic

Typical Emission Factors:

HDPE / PP: ~1.8 lbs CO_2e/lb

PET: ~2.8 lbs CO_2e/lb

Example Emission Factors (varies by country):

Renewable energy: ~0.22 lbs CO_2e/kWh

Grid average (USA): ~0.88 lbs CO_2e/kWh

Coal-heavy regions: ~1.98 lbs CO_2e/kWh

03

Strategies for Carbon Footprint Reduction

Energy optimization, material efficiency and other advancements

Strategies for Carbon Footprint Reduction

Energy optimization

Target is to outperform the best Euromap 46.1 Class

10	< 0,29 kWh/kg
9	< 0,34 kWh/kg
8	< 0,39 kWh/kg
7	< 0,45 kWh/kg
6	< 0,53 kWh/kg
5	< 0,62 kWh/kg
4	< 0,80 kWh/kg
3	< 1,00 kWh/kg
2	< 1,30 kWh/kg
1	> 1,30 kWh/kg

Achievable number: 0.22 kWh/kg ≈ 99.8 Wh/lbs

24% better than the best Euromap 46.1 Class of Efficiency!

Strategies for Carbon Footprint Reduction

Energy optimization

Real life scenario: **55 gal Tight Head Drum**

- Net weight: 20.7 lbs
- Gross weight: 29.4 lbs
- Yearly production: 228,000 pcs/year
- Total raw material processed (HDPE): 3,351.6 ton/year

ST BlowMoulding	668,979 kWh/y
EUROMAP Class 4 Supplier	2,189,935 kWh/y (+227%)

Strategies for Carbon Footprint Reduction

Energy optimization

ST BlowMoulding	668,979 kWh/y
EUROMAP Class 4 Supplier	2,189,935 kWh/y (+227%)

From Energy Consumption to **Carbon Footprint**: how "green" is your energy supply? Assuming **0,5 lbs CO_2** / kWh:

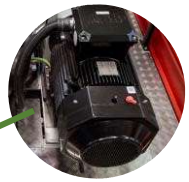
ST BlowMoulding	167.2 tons CO_2/y
EUROMAP Class 4 Supplier	547.4 tons CO_2/y

Strategies for Carbon Footprint Reduction

Energy optimization

Heat insulation of the plasticizing units (extruders and heads)

Synchronous reluctancy motors for the extruders



All-electric machines (when applicable), or electric clamping unit

Smart oil management and variable speed hydraulic pumps (for the hydraulic machines)

Energy analytics tools & Advanced Process Control

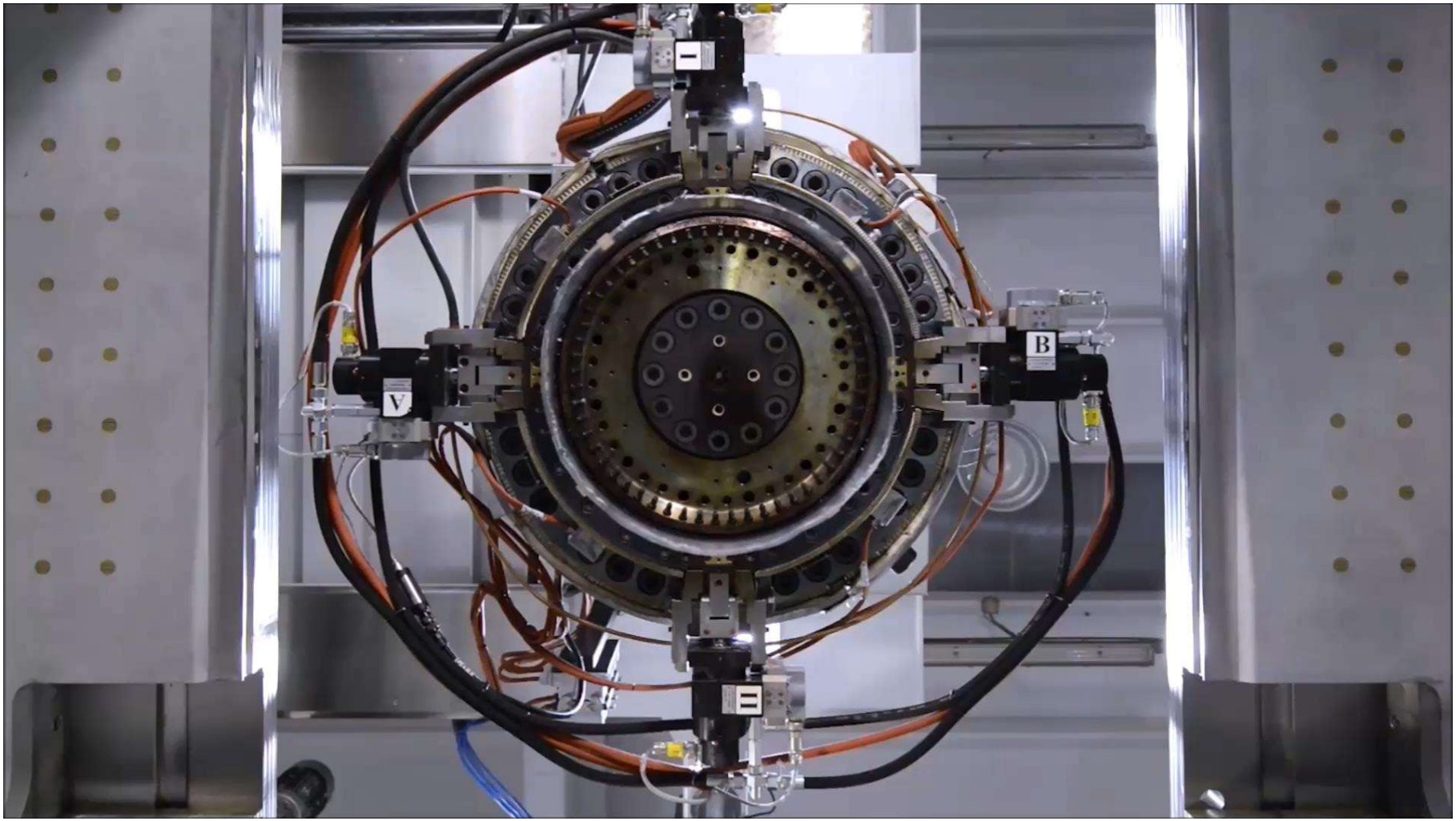
Strategies for Carbon Footprint Reduction

Reducing the Raw Material consumption

- **Reducing the weight** of the blow moulded item is the obvious way to reduce the raw material consumption
- The better you can **control the parison thickness** during the extrusion, the lighter the blow moulded item will be
- High resolution of the parison thickness profiles and radial control of the parison thickness are key tools

Strategies for Carbon Footprint Reduction

Reducing the Raw Material consumption



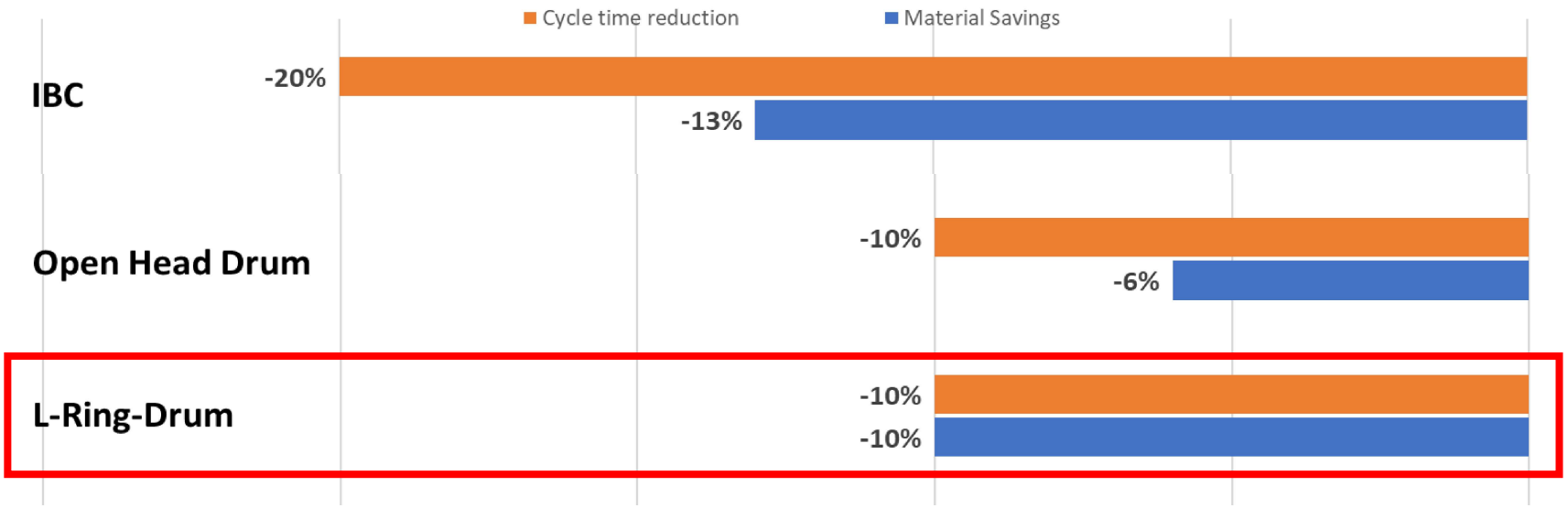
Strategies for Carbon Footprint Reduction

Reducing the Raw Material consumption

The dynamic radial control **removes the thickness excess** and achieves a uniform wall thickness:

No extra thickness → lower part weight → less raw material use

No thick zones → faster cycle time → more production capacity



Strategies for Carbon Footprint Reduction

Reducing the Raw Material consumption

Real life scenario: **55 gal Tight Head Drum**

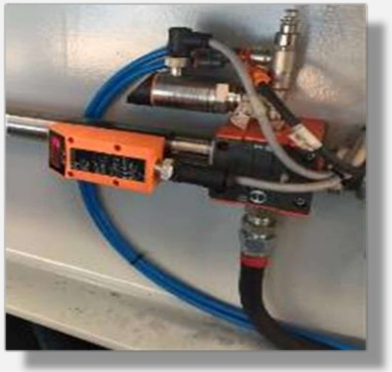
- Original gross weight: 29.4 lbs
- Total raw material processed (HDPE): 3,351.6 ton/year

10% weight reduction:	saving 670,320 lbs/y
326.7 Wh/lbs energy efficiency:	saving 218,993 kWh/y
Assuming 1.8 lbs CO_2e/lbs:	saving 603.2 tons CO_2/y

Strategies for Carbon Footprint Reduction

Process stability for quality consistency

Process stability is key to achieve quality consistency of the production (reducing NOK parts)

- Times of all process steps
- Power consumption of each motor and heater
- Temperature and flow rate of cooling fluids
- Flow rate and moisture content of compressed air
- Hydraulic oil contamination

Strategies for Carbon Footprint Reduction

Process stability for quality consistency

The machine must be able to effectively process all data collected

The machine must be able to communicate with the human operator in a simple and clear manner

The machine must be able to automatically react to a process value variation («intelligent machine»)

Strategies for Carbon Footprint Reduction

Process stability for quality consistency

Real life scenario: **55 gal Tight Head Drum**

- Gross weight: 26.4 lbs
- Total raw material processed (HDPE): 3,351.6 ton/year

5% less rejects:	saving 335,160 lbs/y
326.7 Wh/lbs energy efficiency:	saving 109,496 kWh/y
Assuming 0,5 lbs CO_2/kWh:	saving 27,3 tons CO2/y

04
Case Study

Modern Equipment in Action

Case Study

Modern Equipment in Action

- Vertical Parison transfer
- W. Müller continuous extrusion head
- Fully electric machine (hydraulic mold movements)
- SPC/OEE data collection
- Energy consumption analytics

Case Study

Modern Equipment in Action

	Before	**After**
Net weight	20,7 lbs	**18,6 lbs**
Total raw material processed	3,351.6 ton	**3,016.4 ton**
Total Energy consumption	2,189,935 kWh	**668,979 kWh**

Case Study

Reducing the Carbon Footprint is economically profitable?

- Higher energy efficiency — - 1,520,956 kWh / year
- Lighter part weight (-10%) — - 218,993 kWh / year
- Less rejects (-5%) — - 109.496 kWh / year

— 1.849.445 kWh / year

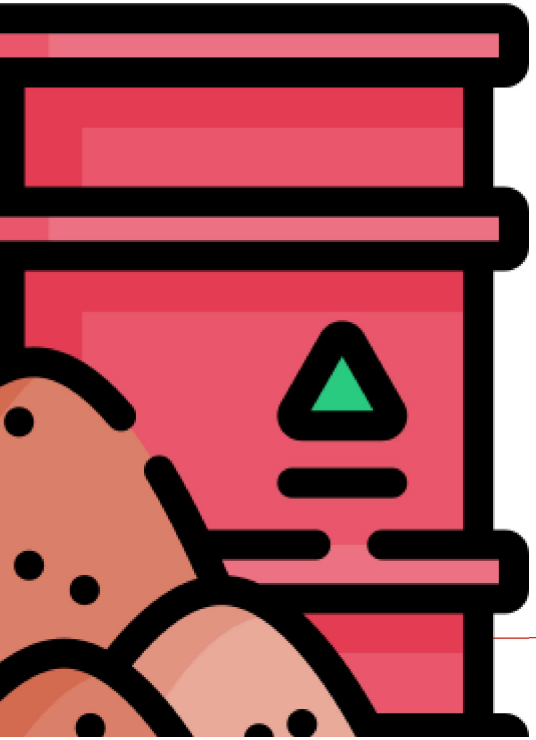
0.08 $/kWh — **- 147.947 $/year**

Case Study

Reducing the Carbon Footprint is economically profitable?

- Lighter part weight (-10%) - 670,320 lbs / year
- Less rejects (-5%) - 0 lbs / year

- 670,320 lbs / year



0.56 $/lbs **- 375.379 $/year**

Case Study

Reducing the Carbon Footprint is economically profitable?

Total **523,334 $** saved

Total **462,2 tons CO2** saved

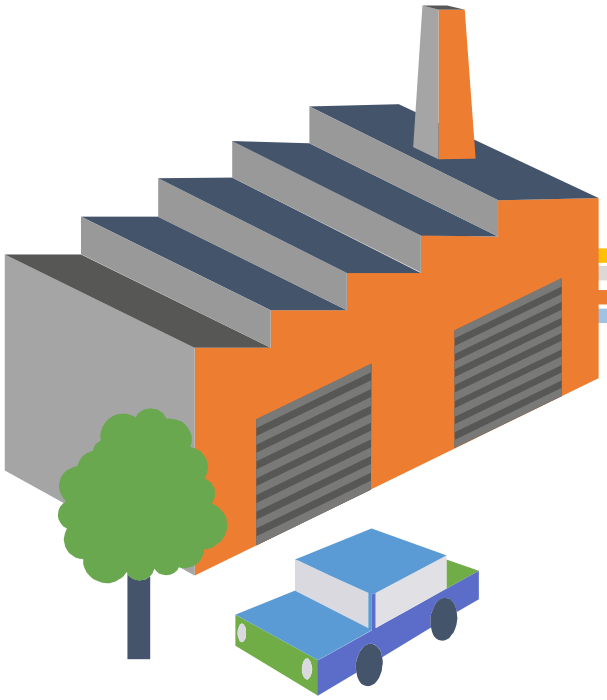
\+ additional **603.2 tons CO2** indirect savings by reducing the part weight

05
Looking Ahead

Vision for the “Carbon-Neutral” Blow Molding Plant

Looking Ahead

"Green Dream"



- Runs on 100% renewable energy
- Produces goods that meet market needs while protecting the planet
- Emits net-zero greenhouse gases from internal operations
- Uses circular or bio-based materials