

**orenda**

# THE EVOLUTION OF PULVERIZING TECHNOLOGY



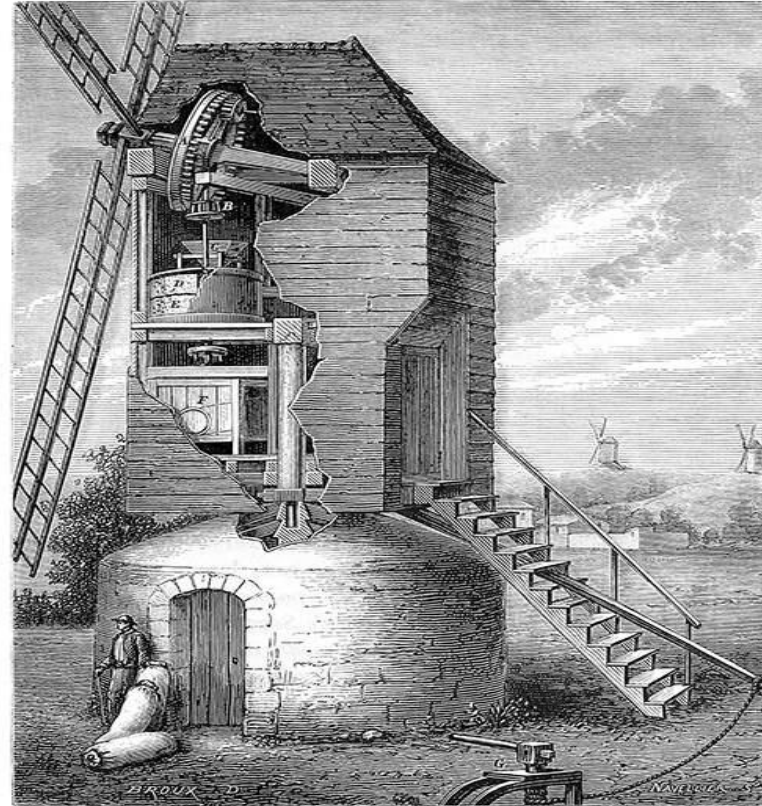
# The Beginning

- ▶ Originally, manual grinders were created to reduce whole grains into flour
- ▶ Over time, the process evolved to include tools such as grinding stones that were spun manually setting the foundation for the process used today



# Commercialization

- ▶ Demand for ground material increased resulting in variety of innovations to maximize production
- ▶ More efficient sources of energy were utilized:
  - Animals
  - Wind
  - Water



# Electricity

- ▶ As technology advanced, electricity became the main source of energy in pulverizing
- ▶ Relays and analog cages were used to control the pulverizing process

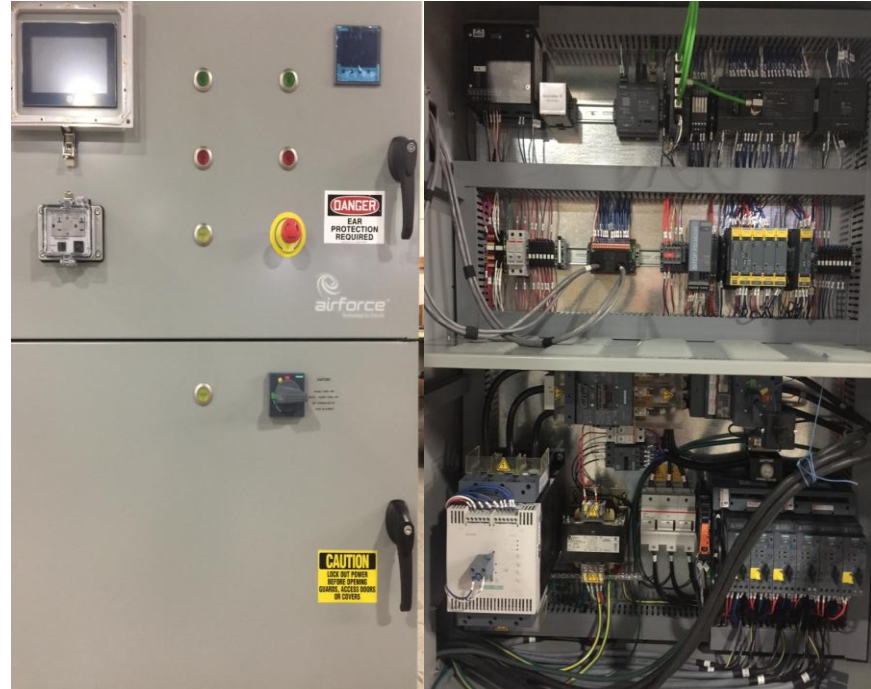


# Increased Demand in Powders

- ▶ Demand for pulverized materials increased proportionally with the industrial revolution
  
- ▶ The range of process-able materials expanded to include:
  - Polymers
  - Chemicals
  - Other materials

# The Digital Era

- ▶ In the late 80's, the first programming logic controllers (PLCs) were introduced to manufacturing
- ▶ These simplified controls were able to tightly manage the process with minimal human intervention



# Process Optimization

In the 20<sup>th</sup> century, the pulverizing industry faced challenges due to:

- Increased costs for:
  - Energy
  - Labour
  - Industrial space
  - Transportation
- International competition
- Tight profit margins
- Employee turnaround
- Safety expectations

This forced manufacturers to optimize:

- Energy consumption
- Maintenance costs
- Down time and recovery
- Quick support
- Ease of operation
- Stability and safety of operation

# AirForce® Technology

- ▶ Introduced in 2014
- ▶ Operating in high and low ambient temperatures
- ▶ At high and low altitudes
- ▶ Pulverizing high and low density polymers

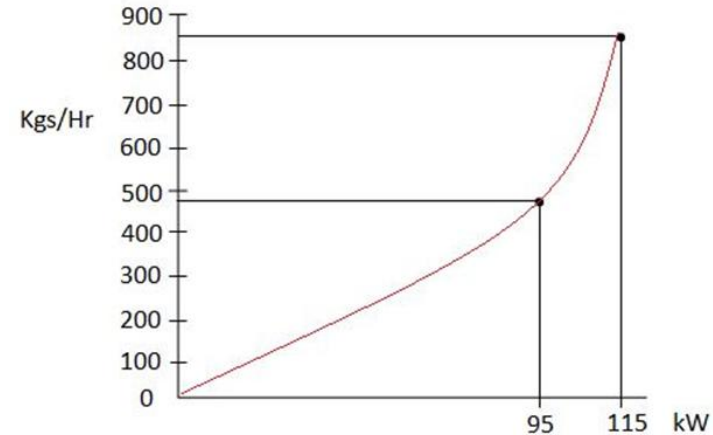


# Optimized Energy Consumption

	Mill	Energy System	Production Rate
Orenda AirForce H1D500	Single	115 kW	700-900 kgs/hr
Other Pulverizers	Single or dual	110 – 120 kW	400-600 kgs/hr

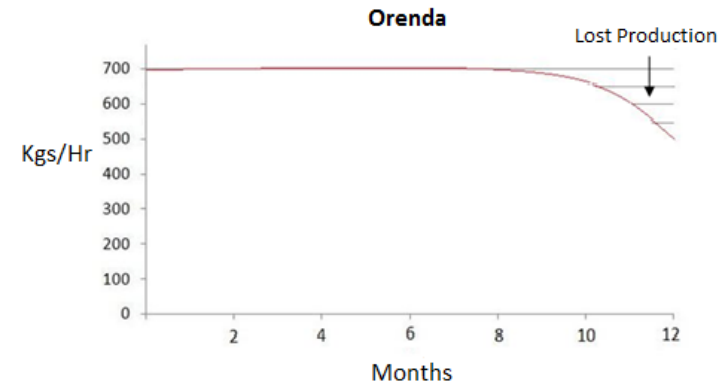
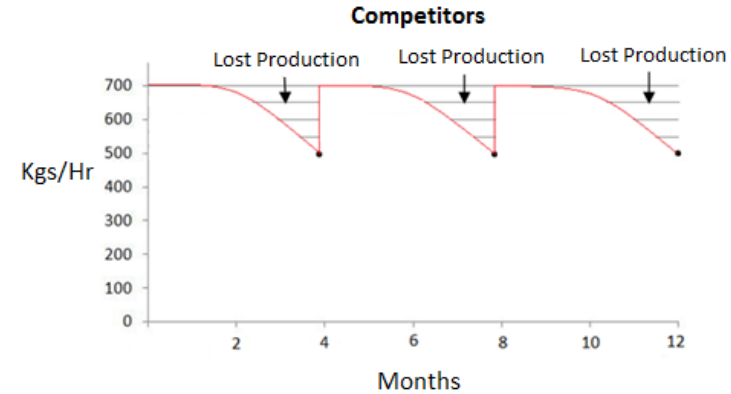
## ▶ Common Production issues

- Wasted Energy from not optimizing motor load to  $\geq 90\%$
- Insufficient cooling causing fear of meltdown
- Blade design
- Multiple mill imbalance



# Optimized Maintenance Costs

- 1) Single mill systems require less maintenance when compared to multi mill systems
  - 2) Double faced disposable discs require less handling when compared to single faced or segmented
  - 3) Airforce® discs perform up to three times longer than conventional ones
  - 4) Bearings and seals are air cooled, doubling their lifespan
  - 5) No water cooling or related maintenance required
  - 6) Remote troubleshooting
  - 7) No meltdowns
- ▶ Based on customer feedback, these factors increase the average production while decreasing all disc related expenses by two-thirds



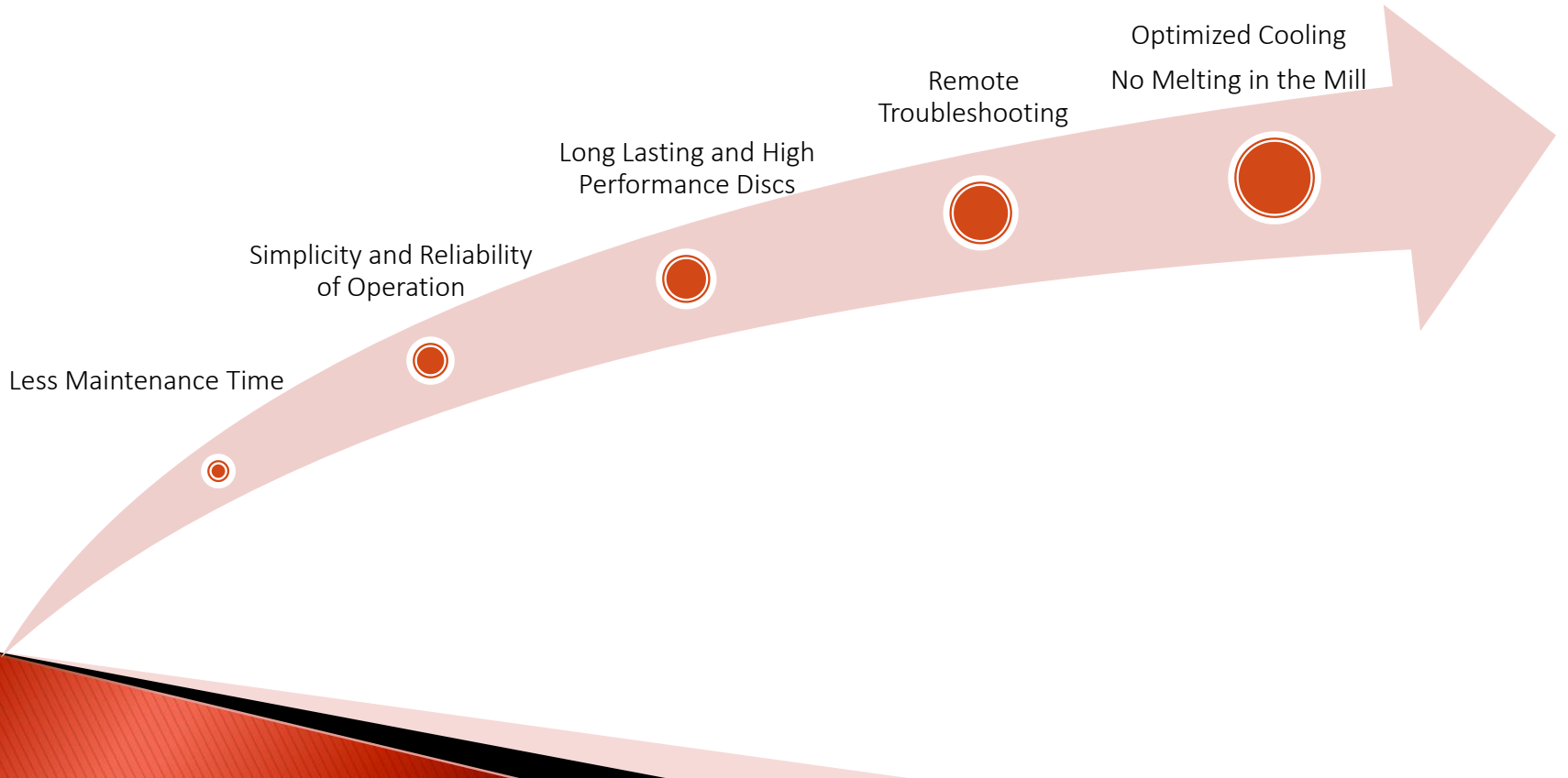
DOES THIS LOOK FAMILIAR? WITH THE **ORENDA AIRFORCE** THIS IS A THING OF THE PAST



**OUR PROMISE**

**YOU WILL NEVER HAVE TO DEAL WITH THIS AGAIN,  
BECAUSE YOU HAVE BETTER THINGS TO DO WITH YOUR TIME**

# Increase in Average Operating Hours



# Process Wider Spectrum of Materials

- ▶ Materials successfully pulverized at higher rates and quality

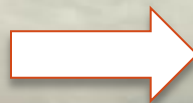
Company	Material
Marlex Chevron Philips	Low density polyethylene
Ampacet	EVA
Clariant	P.P.
Rotoworks	P.P PMPP1 41



Low Density PE



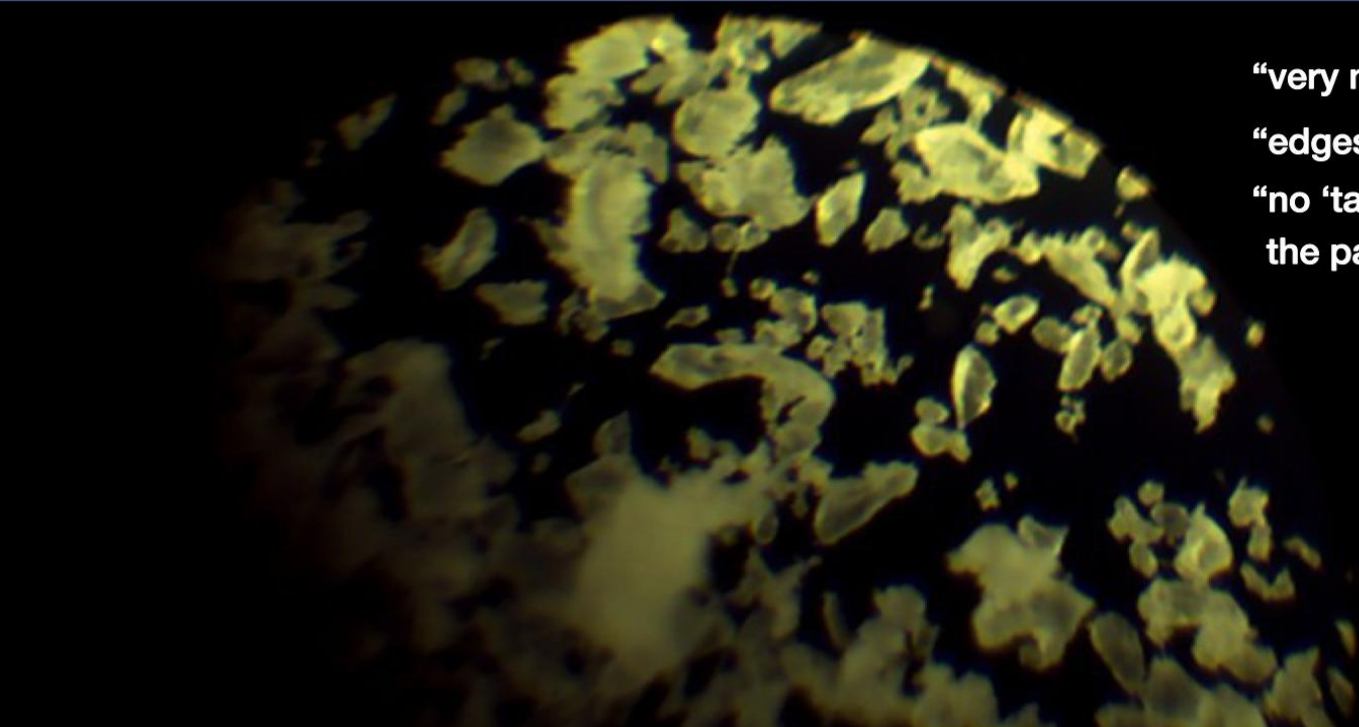
P.P PMPP141



# Exceptional Powder Quality

- ▶ The finished material particles are granular-like with homogeneous morphology, providing exceptional flow properties and bulk density
- ▶ The material is pulverized at a high temperature but the discs remain cool, thus preventing the pulverized particles from fusing to the disc and creating a meltdown
- ▶ Better powder particle morphology enhances productivity while reducing the rejection rate of finished rotomolded parts

## Microscope image of pulverized product



“very nice material morphology”

“edges of particles are smooth”

“no ‘tails’ coming off the edge of the particles”

Sam D’Uva  
Ingenia Polymers



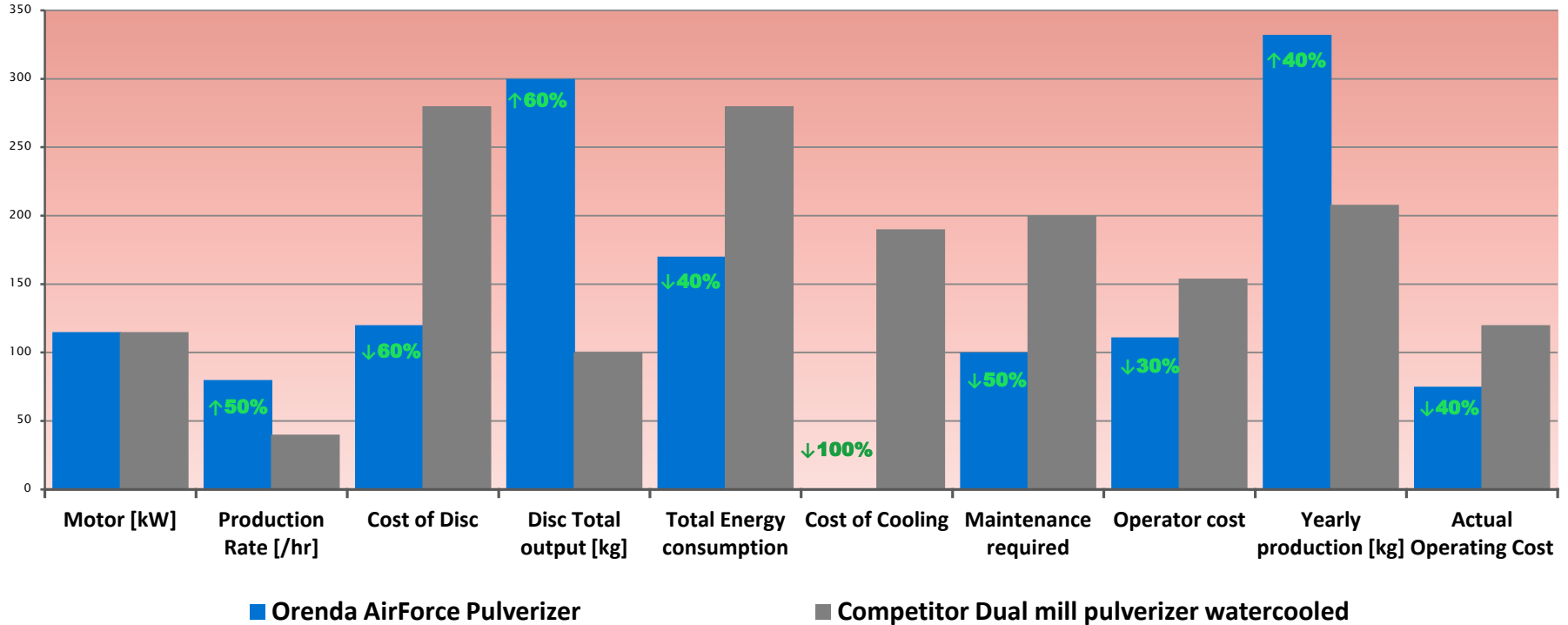
# Design of the AirForce®

- ▶ Compact Design
  - At 2159 x 5588 mm, the AirForce® is one of the most compact designs available
- ▶ Operator Friendly
  - Easy to operate
- ▶ Minimizes Cleaning to less than one hour for color changes
  - The quick cleaning option include:
    - Pneumatic sifter
    - Quick clean gate
    - Cyclone bottom swivels to open while keeping all piping intact
- ▶ The AirForce® pulverizer has been designed to prevent material from escaping at the bottom of the mill, eliminating the chances of cross contamination while maintaining a clean space surrounding the pulverizer

# Customer Feedback on Operating Costs

- ▶ Orenda pulverizers minimize operating and maintenance costs while increasing production
- ▶ As seen on the following customer comparison sheet including all production expenses, AirForce® delivers the lowest cost operation (Euros per kilo)

# Production Cost Analysis



\* Data is considered in Hundreds

# Delivered

## Reduction In

- Energy Consumption per Kg of Material Pulverized
- Maintenance Costs
- Cleaning Time

## Elimination Of

- Mill Adjustments and Calibrations
- Meltdowns
- Powder Escaping the Mill

## Increase In

- Stable Hours of Operation
- Versatility in Pulverizing a Wider Spectrum of Materials

## Design

- Operator Friendly
- Tools to Minimize Contamination Between Color Materials
- Remote Troubleshooting

# AirForce® Models: Auto Gap Adjust

- ▶ The latest AirForce® models can incorporate an option for adjusting the disc gap:
  - The first option features a manual Quick Gap Adjust design, which allows the operator to simply turn a dial to adjust the disc gap
  - The second option has a fully automated Smart Adjust system which incorporates artificial intelligence for maximum efficiency to obtain the optimum gap for the desired powder quality
- ▶ Both are significant advancements that eliminate costly downtime
- ▶ Operators no longer need to stop machines for time consuming adjustments

# Summary

- ▶ Since 2014, the AirForce® technology has revolutionized pulverizing
- ▶ All claims are based on testimonials and customer feedback
- ▶ References are available upon request

# Orenda Pulverizers

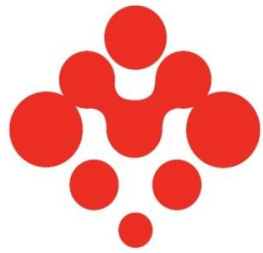
**Established in 1996 in Toronto,  
Ontario, Canada**

**A second facility was opened  
in Europe in 2012**

**Patented Airforce® Technology  
was introduced in 2014**

**2020, now a leader in the  
industry**





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THANK YOU FOR THE TIME YOU HAVE GIVEN US TODAY

