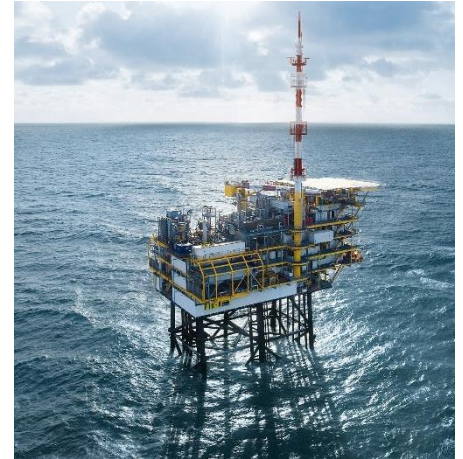


Chemical Intermediates Division



The efficient alternative
Formic Acid

Agenda

1 About BASF Slides 3

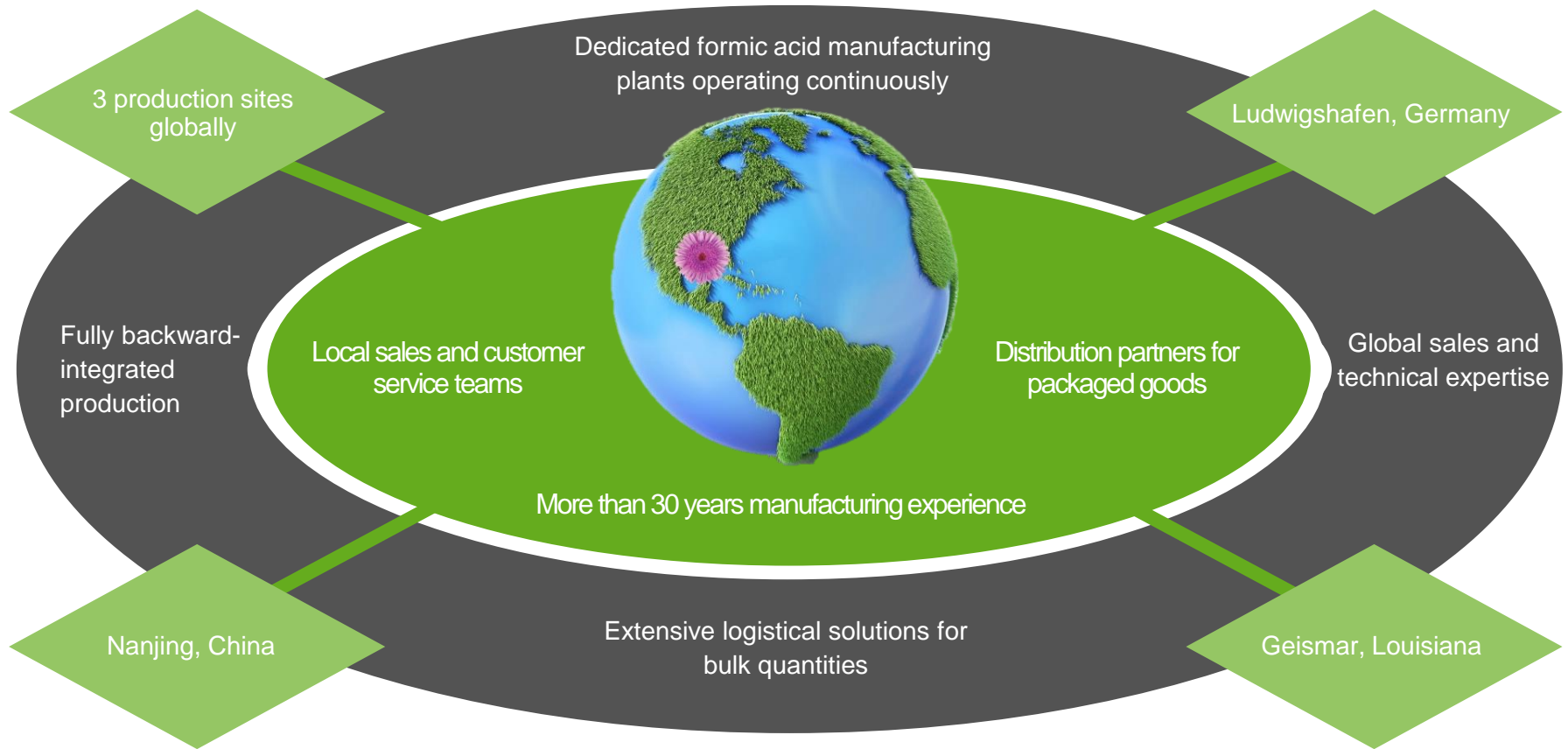
2 Benefits and acid comparison Slides 4-5

3 The efficient alternative Slides 6-7

4 Applications Slides 8-9

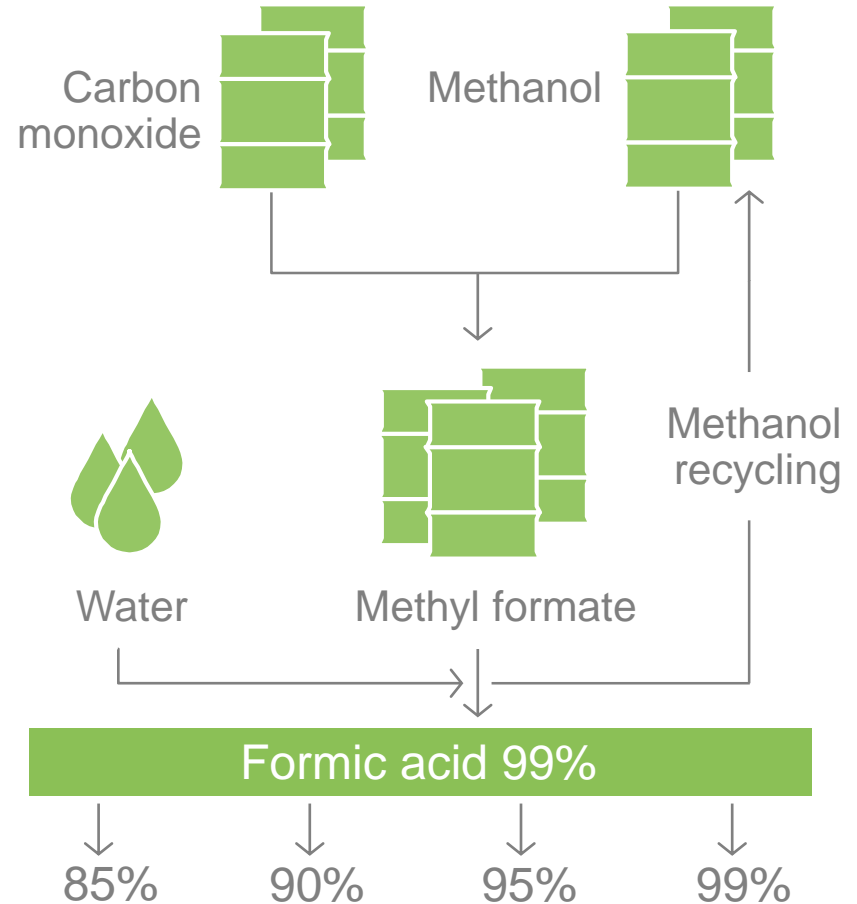
5 Value in your partnership Slide 10

At a glance...



Customer benefits

- Features high purity and quality based on basic building blocks starting with carbon monoxide
- 4 select concentrations available for delivery – ready to use
(See graphic)
- Scores high in many applications by combining excellent efficiency with a low environmental impact



Environmental comparison

	Organic acids				Inorganic acids			
	Formic acid	Citric acid	Acetic acid	Lactic acid	Nitric acid	Phosphoric acid	Sulfuric acid	Sulfamic acid
Chemical Oxygen Demand g O ₂ / kg acid	348	750	1067	1067	N/A	N/A	N/A	N/A
Nitrogen emissions	■	■	■	■	■	■	■	■
Phosphorus emissions	■	■	■	■	■	■	■	■
Sulfur emissions	■	■	■	■	■	■	■	■

Formic acid has the lowest chemical oxygen demand among organic acids

Formic acid does not release nitrogen, phosphorous or sulfur

Key:
 ■ Advantage
 ■ Disadvantage

Acid substitution

Sulfamic acid

Substituting with *formic acid* offers:



- ✓ Liquid handling
- ✓ No nitrogen or sulfur



Phosphoric acid

Substituting with *formic acid* offers:



- ✓ 10X better calcium solubility
- ✓ No phosphorous or phosphates



Acetic acid

Substituting with *formic acid* offers:



- ✓ 10X stronger acid (based on pKa)
- ✓ 1/3 Chemical Oxygen Demand



The efficient alternative

Advantages vs. other organic acids

- One of the strongest organic acids
- Highest acid density (acid weight equivalent per unit)
- Lowest chemical oxygen demand (COD)

Advantages vs. some inorganic acids

- No release of phosphorous or nitrogen that can cause eutrophication
- Less corrosive than most inorganic acids
- Readily biodegradable



Formic acid is the efficient and environmentally compatible alternative.

Major applications and uses



Cleaning and descaling

Effective removal of mineral scale with better calcium salt solubility than phosphoric acid



Deicing runways and roadways

Lower Chemical Oxygen Demand (COD) than comparable acetates



Oil and gas

Efficient well acidizing and reduced corrosion in high pressure, high temperature wells



Animal feed

Preserves feed and silage for healthy animals and safe food



Leather and textiles

More efficient than acetic acid in leather and textile processing operations

The efficient alternative

Additional applications

- Bleaching (wool, cotton, pulp and paper)
- Coagulation of natural rubber
- Disinfection (European registration only)
- Epoxidizing agent for soybean oil
- Flavors and fragrance
- Fuel cells (hydrogen donor)
- Heat transfer fluids (potassium formate)
- Neutralization reactions (pH control)
- Paint removal
- Polyalcohols (process chemical)
- Rust removal (metal industry)
- Varroa mite control (bee miticide)
- Water well rehabilitation
- Wet flue gas desulfurization



Value in your partnership with BASF

Why BASF?

A global footprint and a local presence in Geismar, Louisiana

Why formic acid?

The efficient alternative to promote environmental sustainability

Formic acid has proven beneficial for the purpose of deicing runways for customers like **Nachurs Alpine Solutions**

“The opportunity to partner with BASF in producing new chemistries was a perfect one, which allowed us to leverage their new formic acid production facility and offer a deicer alternative to airports looking to minimize their environmental impact.”

-Carla Potts, Business Manager of Nachurs Alpine Solutions

See full video on deicing using formic acid [here](#).





We create chemistry