Partners of the international milling industry – “We make good flours even better!”

Marvin Jaeger
Area Sales Manager East and Southern Africa

Annette Büter
Technical Application Manager – Flour fortification
Agenda:

1. Introduction to Mühlenchemie

2. Fortification Premixes for Maize flour
Your Contact Persons

Marvin Jaeger
Area Sales Manager

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Sales

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Food Technologist
Baking

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Food Technologist
Baking

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Sales

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R&D South Africa

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R&D Fortification

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R&D Pasta

Melanie Nikschat
Fortification Repr.
Uganda
We are flour ...

- 93 years of experience
- Over 2,000 customized products for flour improvement and flour fortification
- Contacts with 1,000 mills internationally
- Exports to over 100 countries
Stern-Wywiol Gruppe – owner-managed
Under the umbrella of the group, eleven German ingredients firms cooperate as a centre of excellence
We believe in communication ...

... with our customers, international organizations and research scientists from many disciplines. Progress in flour improvement can only be achieved through dialogue.

**International symposium “Future of Flour”**

**Fruitful partnerships:**
- **2000** Mutual support with the Flour Fortification Initiative (FFI), the Global Alliance for Improved Nutrition (GAIN), WHO and Helen Keller International
- **2010** Renewal of strategic cooperation with BASF
- **2015** Member of the SUN Business Network

**Ahrensburg Technology Centre:**
- **2003** Establishment of the Technology Centre in Ahrensburg
- **2012** Enlargement to 3,000 m² of laboratories and training facilities
Technology Center Ahrensburg
We explore our customers’ wishes and develop new functional systems.

The technology centre:
1. Sensory laboratory
2. Enzyme laboratory
3. Pasta laboratory
4. Lecithins and lipids laboratory
5. Flavour laboratory
6. Laboratory for vitamins
7. Milling pilot plant
8. Trial bakery
9. Analytics
10. Rheological laboratory
11. Deli foods laboratory
12. Dairy and ice cream laboratory
13. Meat and fish laboratory
14. Fluidized bed and spraying technology
Baking Laboratory
Baking Laboratory
Pasta Laboratory
Mühlenchemie workshops and training events

- Conduct of training events, seminars and workshops
  - at our Technology Centre and
  - at our customers’ facilities worldwide

- Product development

- Conduct of tests and analysis of the flour for its rheological properties

- Development of tailor-made solutions
Mühlenchemie Workshops in Africa
Production Plant Wittenburg

- Fluidized bed technology

- Fully-automated production lines
Maize flour fortification
Ingredients of a premix for maize flour

- Vitamin B₁₂
- Free flowing agent (silicon dioxide)
- Folic acid
- Zinc (zinc oxide)
- Iron (Na Fe EDTA)
- Carrier (maize starch)
Ingredients of a premix for maize flour

- Vitamin A powder
- Vitamin B1 & B6
- Niacin
- Vitamin B2
Ingredients of a premix for maize flour

Premix: ELCOvit 13514 according to East African Standard for maize flour
Dosage to flour: 500 ppm (0.5 g to 1 kg of flour)
# Stability of vitamins

<table>
<thead>
<tr>
<th></th>
<th>Light</th>
<th>Heat</th>
<th>Oxygen</th>
<th>Humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>xxx</td>
<td>xx</td>
<td>xxx</td>
<td>x</td>
</tr>
<tr>
<td>Vitamin B1</td>
<td>xx</td>
<td>xxx</td>
<td>x</td>
<td>xx</td>
</tr>
<tr>
<td>Vitamin B2</td>
<td>xxx</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Niacin</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Vitamin B6</td>
<td>xx</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>xx</td>
<td>x</td>
<td>x</td>
<td>xx</td>
</tr>
<tr>
<td>Folic acid</td>
<td>xx</td>
<td>x</td>
<td>xxx</td>
<td>x</td>
</tr>
</tbody>
</table>

- x  = hardly or not sensitive
- xx = sensitive
- xxx = very sensitive
Shelf life of the micronutrient premix

Example of premix specification listing composition of premix

Storage and shelf-life: Min. 12 months if stored dry in closed original packing at temperatures < 25°C. Rapid and substantial changes in ambient temperatures during storage and handling should be avoided.

Packaging: Cardboard box with aluminium inliner.

The premix’ shelf life refers to minimum levels in the premix – NOT to the end product!

<table>
<thead>
<tr>
<th>Chemical Characteristics</th>
<th>Property</th>
<th>Method</th>
<th>Dimension</th>
<th>Target</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vitamins/minerals:</td>
<td>g/kg</td>
<td></td>
<td>1,38</td>
<td>1.24-</td>
<td>1.51</td>
</tr>
<tr>
<td></td>
<td>Vitamin A (retinol)</td>
<td>g/kg</td>
<td></td>
<td>6,60</td>
<td>5,94-</td>
<td>7,26</td>
</tr>
<tr>
<td></td>
<td>Vitamin B1 (thiamin)</td>
<td>g/kg</td>
<td></td>
<td>4,40</td>
<td>3,96-</td>
<td>4,84</td>
</tr>
<tr>
<td></td>
<td>Vitamin B2 (riboflavin)</td>
<td>g/kg</td>
<td></td>
<td>42,40</td>
<td>39,50-</td>
<td>45,80</td>
</tr>
<tr>
<td></td>
<td>Niacin</td>
<td>g/kg</td>
<td></td>
<td>32.78</td>
<td>29,502-</td>
<td>36,058</td>
</tr>
<tr>
<td></td>
<td>Vitamin B6 (pyridoxine)</td>
<td>g/kg</td>
<td></td>
<td>4,40</td>
<td>3,96-</td>
<td>4,84</td>
</tr>
<tr>
<td></td>
<td>Folic acid</td>
<td>g/kg</td>
<td></td>
<td>1,32</td>
<td>1,188-</td>
<td>1,452</td>
</tr>
<tr>
<td></td>
<td>Vitamin B12 (cyanocobalamin)</td>
<td>mg/kg</td>
<td></td>
<td>19,25</td>
<td>17,33-</td>
<td>21,18</td>
</tr>
<tr>
<td></td>
<td>Zinc</td>
<td>g/kg</td>
<td></td>
<td>72.60</td>
<td>65,34-</td>
<td>79,86</td>
</tr>
<tr>
<td></td>
<td>Iron</td>
<td>g/kg</td>
<td></td>
<td>22,00</td>
<td>19,8-</td>
<td>24,2</td>
</tr>
</tbody>
</table>
Shelf life of end product

The premix is designed to meet the targets in the end product. Overages ensure micronutrient levels are sufficient throughout shelf life.

<table>
<thead>
<tr>
<th>Micronutrient premix</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>0.55 mg</td>
</tr>
<tr>
<td>Vitamin B1</td>
<td>3.30 mg</td>
</tr>
<tr>
<td>Vitamin B2</td>
<td>2.20 mg</td>
</tr>
<tr>
<td>Niacin</td>
<td>16.39 mg</td>
</tr>
<tr>
<td>Vitamin B6</td>
<td>2.20 mg</td>
</tr>
<tr>
<td>Folic acid</td>
<td>0.66 mg</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>7.70 mcg</td>
</tr>
<tr>
<td>Zinc</td>
<td>36.30 mg</td>
</tr>
<tr>
<td>Iron</td>
<td>11.00 mg</td>
</tr>
</tbody>
</table>
Levels of micronutrients in end product over shelf life

% level of micronutrients in end product

Age of end product in months
Advantages of using micronutrient premixes

- Constant ratio of ingredients allows for easy application and low risk of error
- Analysis of premix level in flour (QC) by using only one constituent as indicator
- Free-flow agents allow for homogeneous addition
- Mühlenchemie’s knowledge of best ingredients and solution for milling industry
- Mühlenchemie’s support with trouble-shooting and analytical services
These factors ensure an easy handling:

Protect premix from moisture and heat
- Storage conditions
  < 75% r.H
  <25°C / 77°F
- Aluminium packaging

Flowable premix
- Free flowing agents
- Appropriate carrier

Appropriate feeder
Fortified flour – vitamins for a healthy life