



Leader in flour applications.

# Enzymatic Solutions to replace chemicals in wheat flour treatments

- Calcium Peroxide (CP)
- Azodicarbonamide (ADA)

Norman Loop  
Mühlenchemie GmbH & Co. KG  
Ahrensburg, Germany

Mühlenchemie is a member  
of the Stern-Wywiol Gruppe



# Agenda

- ◆ Muehlenchemie
- ◆ Chemical oxidants in flour milling industry
- ◆ Regulatory / Legal status
- ◆ How to replace them? Practical Examples
  - Calcium Peroxide (CP) Replacement
  - Azodicarbonamide (ADA) Replacement
- ◆ Conclusion

# Mühlchemie: the Flour Company

We are an innovative enterprise – present in the market for over 90 years:  
Mühlchemie makes good flours even better.

<b>Established:</b>	1923
<b>Domicile:</b>	Ahrensburg / Hamburg
<b>Parent company:</b>	Stern-Wywiol Gruppe, Hamburg
<b>Specialization:</b>	<ul style="list-style-type: none"><li>▪ Flour improvers</li><li>▪ Enzymes</li><li>▪ Vitamin and mineral premixes</li><li>▪ Applications consultancy</li><li>▪ Analytical service</li><li>▪ Training courses and seminars</li></ul>

# Mühlentchemie: the Flour Company

<b>Market position:</b>	World market leader in flour improvers
<b>Turnover:</b>	approx 150 mill. USD
<b>Sales:</b>	In more than 110 countries globally
<b>Production facilities:</b>	Germany, China, India, Mexico, Turkey, USA and Malaysia
<b>Our dedication to millers:</b>	The FlourWorld Museum: a collection of more than 3,000 flour sacks from the milling industry



# Chemical oxidants in flour milling industry



**“Would you eat your yoga mat?”**

# Oxidizing Agents as Flour Improvers

- ◆ Azodicarbonamide (ADA)
- ◆ Calcium peroxide (CP)
- ◆ Chlorine & chlorine dioxide
- ◆ Benzoyl peroxide (BPO)
- ◆ Potassium Bromate

## Calcium Peroxide (CP)

- ◆ **Slow oxidizing effect**
- ◆ **Improves dough handling properties (drying effect)**
- ◆ **Improves stability in long fermentation (also for drop test)**
- ◆ **Slightly help in volume yield**
- ◆ **Improves slicing characteristics**

## Azodicarbonamide (ADA)

- ◆ **Fast oxidizing effect**
- ◆ **Improves dough stability**
- ◆ **Improves crumb structure**, but sometimes a few larger holes





# Regulatory and Legal Status

- European Union (EU)
- China
- Indonesia
- Philippines
- Malaysia
- Thailand
- Singapore

# Oxidants - status in selected countries



**Bromate**

--	--	--	--	--	--	--	--

**Calcium Peroxide**

		BPOM	100ppm	100ppm			
--	--	------	--------	--------	--	--	--

**ADA**

	45ppm	BPOM	45ppm	45ppm	45ppm		
--	-------	------	-------	-------	-------	--	--

**BPO**

			300ppm	50ppm	60ppm <sup>1</sup> / 150ppm <sup>2</sup>		50ppm
--	--	--	--------	-------	---	--	-------

**Ascorbic Acid**

**	200ppm	**	300ppm	**	300ppm <sup>1</sup> / 60ppm <sup>2</sup>		**
----	--------	----	--------	----	---	--	----

**LEGEND:**

\*\* = not clearly stated, but far above what is needed in baking application

1 = codex alimentarius

2 = Thailand - Standard for Wheat Flour : Bread Flour



Spotlight on

## Calcium Peroxide Replacement ADA Replacement



# Calcium Peroxide Replacement

**Gloxy SI**



**NEW generation**  
**Glucose**  
**Oxidase**  
**(Gloxy SI)**

**Dough**  
**drying**

- \* **Enzymatic replacer of CP**
- \* **Guided dosage: 50ppm**  
- for every 20ppm of CP / Calco 75  
(depends on oxidizing strength, flour quality, etc)

\* **Handling / Machinability / stickiness**

**Dough**  
**strengthening**

\* **Baking performance (volume)**

# CP Replacement – 13.5% protein bread flour (16% sugar)

Additives		Control	T1	T2	T3
Base treatment <i>(AA, amylase, hemicellulase)</i>	ppm	120	120	120	120
Calco 75 <i>(Calcium peroxide 75%)</i>	ppm	<b>20</b>	---	---	---
Gloxy SI <i>(new generation GOX)</i>	ppm	---	25	---	<b>50</b>
Glucose oxidase <i>(existing GOX)</i>	ppm	---	---	50	---
<b>Dough handling</b>		<b>Dry</b>	<b>Slightly dry</b>	<b>Slightly soft, less dry</b>	<b>Dry</b>
Volume		1612.61	1650.66	1654.55	1661.40
Crumb texture		Fine	Slightly open	Slightly fine	Fine

# CP Replacement – 13.5% protein bread flour (16% sugar)



CONTROL  
20ppm **Calco 75**

T1  
25ppm **Gloxy SI**

T2  
50ppm **existing GOX**

T3  
50ppm **Gloxy SI**



# CP & ADA Replacement – 11.5% protein bread flour (10% sugar)

Additives		Control	T1	T2	T3
Powerzym	ppm	40	40	40	40
ELCO BECS	ppm	60	60	80	80
HC 14090	ppm	25	25	40	55
OXEM 23	ppm	40	40	---	---
Calco 75 <i>(Calcium peroxide 75%)</i>	ppm	20	---	---	---
Gloxy SI <i>(new generation GOX)</i>	ppm	---	50	75	90
<b>Dough handling</b>		<b>Dry, firm</b>	<b>Dry, firm</b>	<b>Dry, soft</b>	<b>Dry, firm</b>
Volume		1755	1725	1740	1795
Crumb texture		comparable	comparable	comparable	comparable



# CP & ADA Replacement – 11.5% protein bread flour (10% sugar)



CONTROL

T1

T2

T3



# CONCLUSION



# THANK YOU



Leader in flour applications.