A proper wheat tempering is obtained when:

- The flour moisture content is satisfy the market rules 13.5 - 15%
- We maximize the extraction of low ash flour from the wheat 78-80 % by reducing the bran pulverization to minimum
TEMPERING FACTORS

The wheat tempering is a combination of 2 elements:

- H2O [kg/h]
- Time [h]
TEMPERING WATER

The amount of tempering water to be added to the raw wheat is easily defined with the following calculation:

- \( H_{20\,\text{tempering}} = \frac{(FL\, H_{20} + M\,\text{loss} - W\, H_{20})}{100} \times Q \)

- \( W\, H_{20} = \text{raw wheat moisture} [\%] \)
- \( FL\, H_{20} = \text{flour moisture} [\%] \)
- \( M\,\text{Loss} = \text{milling loss or evaporation during process} [\%] \)
- \( Q = \text{amount of wheat in [Kg/h]} \)
TEMPERING WATER

- W H2O = raw wheat moisture 12%
- FL H2O = flour moisture 14.5%
- M Loss = milling loss 2.5%
- Q = wheat 15,000 Kg/h (300Mt/24h)

**H2O tempering**

(14.5 + 2.5 – 12) /100 x 10,000 = 750 Kg/h
The total time required by the wheat to absorbed the H2O is subject to the following:

- **Wheat Type (physical characteristic)**
- Amount of Lignin and Cellulose that make bran layers
- Virtuosity of the starchy kernel
- Amount of protein
- Raw wheat initial Moisture
TEMPERING TIME

- Soft Wheat = 6 - 10 h
- Medium Protein Wheat = 8 - 16 h
- Hard Wheat = 15 - 25 h
- Australian Hard Wheat = 24 - 36 h

Average raw wheat moisture 11 - 12.5%
Australian Hard Wheat 8 - 10%
TEMPERING PARAMETER SETTING

Hard wheat  11-13% protein contents
Raw moisture   12 % H2O

- 750 Kg/h H2O
- Resting time of 22 - 24 h

- 1ˢᵗ tempering 12 h and 50 % of H2O
- 2ⁿᵈ tempering 12 h and 50 % of H2O
STANDARD TEMPERING PROCESS
WHEAT KERNEL

- Starchy endosperm (80-85%)
  - Starch & proteins

- Aleurone layer (6-9%)
- Crease

- Germ (3%)
- Inner and outer pericarp (4-5%)
  - Soluble & insoluble dietary fibre (xylans, β-glucans)
  - Proteins
  - Antioxidants (phenolic acids)
  - Vitamin E
  - B vitamins
  - Minerals
  - Phytic acid
  - Enzymes
  - Alkylresorcorhols
  - Insoluble dietary fibre (xylans, cellulose, lignin)
  - Antioxidants bound to cell walls (phenolic acids)

- Testa (1%)

- Bran

- Lipids
- Antioxidants
- Vitamin E
- B vitamins
- Minerals
- Plant sterols
- Enzymes

14-Dec-14
If pericarp is the most water proof protection envelop of the wheat to where is enter the tempering water?

The highest amount of tempering water is absorbed through the germ opening which is less than 10% of the total kernel surface!!!

It is clear now the long time needed to be absorbed and the high moisture on the bran roller mill 2 BK-5 BK
By removing part of the external pericarp
We will remove the most water proof layers

Therefore allow the water to be absorbed by a wider surface in a shorter time.

How can we obtained that?
GIOTTO DECORTICATOR
GIOTTO REMOVED PERICARP 0.2 – 1.5 %
GIOTTO IMPACT ON MILLING YIELD

![Graph showing GIOTTO impact on milling yield with data points and trend lines.]
MOULD Reduction (ISO 21527-2:2008)

- US Wheat Giotto
- US Wheat Scourer
- EU Wheat Giotto
- EU Wheat Scourer
GIOTTO ON INFESTATED WHEAT KERNELS

A ASPERGILLUS

B FUSARIUM
GIOTTO IMPACT ON MICOTOXINS DISTRIBUTION

- Dirty Wheat
- Cleaned Wheat
- Bran
- Flour

Comparison of micotoxins distribution before and after treatment with Giotto.
GIOTTO ACHIVED GOALS

Giotto in operation produced the following results:
1) Reduction of tempering time from form 30 to 40 %
2) No variation of milling loss -0,1 % ( +40.000 $ / year )
3) Reduction of water to be add to wheat 0,5 %
4) Decreased of the milling loss from 2,5 to 2 %
5) Reduction of sifter box cleaning ( 1st Break from 3-6 months )
6) Reduction of wheat ash contents 3 – 10 %
7) Low ash flour extraction increased of 1%
GIOTTO AUTOMATION

Motorized Outlet  Giotto Local Board  Plant Supervisor

Plant Motor Control Center

Power Consumption
GIOTTO ADDITIONAL BENEFIT

- HIGHER STANDARD OF CLEANING IN MILLING PLANT
- EXTENDED FLUTES LIFE ON BREAKS ROLL
- HEALTYER WHOLE MEAL FLOUR
- HEALTYER BY PRODUCTS
# GIOTTO DATA SHEET

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THANK YOU FOR THE ATTENTION !!!