QUICK WHEAT CONDITIONING

CONDITIONAREA RAPIDA A GRAULUI

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Abstract: *The research showed that by quick conditioning, the external layers of the grain get better moisture than the internal ones and this type of proportion is being kept in a certain amount until the end of the grinding. The maximum heating of the wheat is determined by the temperature action upon the protean complex. For the wheat with a poor amount of gluten a more powerful heating must be used and for the wheat with normal amount of gluten and mostly for the one with a rich amount the heating must be more reduced. The heating temperature must be established according to the wheat quality and the degree of improvement of the baking features followed by the action of heat when applying the quick conditioning method. Steam treatment of the wheat grains is the main composing element of the quick conditioning process that exerts the most intense act on the milling proprieties and wheat baking.*

Rezumat: *Cercetarile facute au aratat ca prin conditionarea rapida, straturile exterioare ale bobului se umezesc mai mult decat cele interne si un astfel de raport se pastreaza intr-o anumita masura pana la sfarsitul macinarii. Incalzirea maxima a graului este determinata de actiunea temperaturii asupra complexului proteic. Pentru graul cu glutenul slab este admisibila o incalzire mai mare, iar pentru graul cu glutenul normal si mai ales pentru cel cu glutenul tare, incalzirea trebuie sa fie mai redusa. Temperatura de incalzire trebuie sa fie stabilita in functie de calitatea graului si de gradul de imbunatatire a insusirilor de panificatie urmarita prin actiunea caldurii la aplicarea metodei de conditionare rapida. Tratarea boabelor de grau cu abur este principalul element component al procesului de conditionare rapida, care exercita actiunea cea mai intensa asupra proprietatilor de morarit si panificatie ale graului.*

Key words: *wheat, conditioning, schrot*
Cuvinte cheie: *graul, conditionare, srot*

INTRODUCTION

The main purpose of this technology is to obtain a better use of heat and through this to reduce the moisture period (water impregnation) of grains as well as obtaining the possibility to influence wheat so much so that its milling proprieties and wheat backing would improve and with that flour and bread quality.

Quick conditioning is one of the preparation operations for grinding cereals and is executed between the first and the second cleaning (KENT J., 1987). During the quick conditioning the wheat is submitted to heating, drying, scalding, thermal treatment (a short scalding period in heated state), cooling, (cold water washing), dehydrating (removing the excess of water from surface) and finally a three hour moisture. The degree of humidity and heat of the wheat, according to its initial quality, must be selected so much that the wheat humidity on its passage by shrot I has to correspond to the established humidity.

For the improvement of milling proprieties of the wheat the differential repartition of humidity in the internal and peripheral layers of the grain is of great importance, repartition that depends of the method and conditioning regime (NAUMOV I., 1982).

Through quick conditioning special conditions are made for making such an uneven repartition of the water inside the grain (RÂPEANU R., 1992).

MATERIAL AND METHODS

The research showed that by quick conditioning the external layers of the grain get better moisture than the internal ones and this type of proportion is being kept in a certain amount until the end of the grinding. This permits leading when arriving the passage by schrot I grains with a lower degree of humidity than the established standard, which contributes to the improvement of productivity of the mill in question.

The maximum heating of the wheat is determined by the temperature action upon the protean complex. As it's known, for the wheat with a poor amount of gluten a more powerful heating must be used and for the wheat with normal amount of gluten and mostly for the one with a rich amount the heating must be more reduced. So the heating temperature must be established according to the wheat quality and the degree of improvement of the baking features followed by the action of heat when applying the quick conditioning method.

Regarding this the most powerful effect of quick conditioning can be obtained only with optimal parameters separately established for each composing element of the process. Still, given the extraordinary variety of proprieties of each assortment and mostly of each lot of wheat as well as the different proportion between these, it was not possible to differentiate in mills the regime on different composing elements of the process.

This problem needs to be resolved practically at each mill according to the concrete situations. Still we established the approximate guidelines for wheat lots of average quality (table 1).

Wheat heating is made in heating devices of which surface needs to be heated at 90^0. The size of these devices must be calculated so that the entire cereal quantity will be heated to $35 - 45^0$C (RÂPEANU R., 1992).

Knowing the fact that in the present time cereal heating devices are not made, we can use steam dryers that are used in the croup industry in the heating areas of the air and water conditioning plants and other sort of plants as well as snail drying transporters (steam heating jacket) (KENT J., 1987, RÂPEANU R., 1992). The ideal case would be if these heating devices would be equipped with proper machines that would register the evacuated cereal heat, which would allow the maintenance of the established temperature regime.

Table 1

Approximate orientation regimes of elements in the quick conditioning process

Elements of the process	Temperature (^{0}C)		Humidity (%)		Necessary time (in minutes)
	Before	After	Before	After	
Heating	5 – 20	35 – 45	13.5 – 14.5	13.0 – 14.0	20 - 25
Steam treatment	35 – 45	50 – 60	13.0 – 14.0	14.0 – 15.5	0.5
Thermal treatment	50 – 60	50 – 60	14.0 – 15.0	14.0 – 15.5	Up to 10
Cooling	50 – 60	25 – 30	14.0 – 15.5	16.0 – 17.0	0.5
Dehydration	25 – 30	25 – 30	16.0 – 17.0	15.0 – 16.5	0.5
Damping	25 – 30	25 – 30	15.0 – 16.5	14.5 – 16.0	Up to 180

After heating the grains dry. Lowering or rising the heating temperature we can adjust de damping degree of the grains at the next steam session. The lower the wheat humidity gets the higher its heating must get without surpassing the $45 – 50^0$ limit; the wheat with low humidity can also stay unheated.

Grain steam treatment is the main composing element of the quick conditioning process that exerts the most intense action on the milling proprieties and wheat baking. Steam treatment is made in the "ASK" device especially made by VNIIZ. This device is a spiral transporter in which the steam is introduced and has a direct action on the grains for a period of 30 – 32 seconds. The steam heathens and damps the grain.

The rise of the damping degree of the grains depends on the initial and final temperature of the grains and on the steam treatment technique that creates a certain uniformity of the treatment. The final heating temperature of the grains is established according to the quality of gluten (table 2).

Table 2

Approximate regimes of vapor treatment and temperature limits within quick conditioning

Gluten characteristics	Gluten specific extensibility (cm / min)	Maximum heating temperature of the grains (^{0}C)	Length of thermal treatment of grains at maximum temperature (minutes)
Rich	Up to 0.4	50 – 53	0
Normal	0.4 – 1.0	53 – 57	0 - 4
Poor	1.0 and above	57 – 60 and in some case even higher	4 - 10

Thermal treatment of wheat is done in small compartments with isolation. The compartments must have their cone at an angle of 60 – 70^0 and can be made from steel boards.

The length of the thermal treatment is adjusted according to the deed that must be exercised upon gluten but the general duration of the thermal treatment must not surpass 10 minutes because steam treatment by accelerating the conditioning also contributes to the activity acceleration of heat on gluten.

The cooling of the grains is made by washing with cool water. The purpose is to get the grains' temperature approximately from 50 – 60^0 – the temperature after steam treatment, to 25 – 30^0. Besides this, the quick cooling of the grains contributes to the evaporation of the excess steam that is found between the grains and to the improvement of the milling proprieties of the wheat (the bonds between the layers and the interior parts are weakened).

So that in the washing process the grains won't damp too much, they are directed in the washing tank at the end of the snail transporters in front of the hydro-transporter that places the grains in a squeezing column. The heated grains wash better. Regarding the above, if the grain is not unpurified with river gravel or with smut the quantity of water is lowered. For the cooling process we can also use drum horizontal washing machines.

The wheat dehydrating process is a mechanical process made in the squeezing column of the washing machine in the usual functioning regime of this machine.

Wheat damping is the final stage of the quick conditioning process. This stage takes approximately 3 hours. Experience showed that according to the technological proprieties of the grains and to the parameters of the different composing elements of the quick conditioning process, the damping period can be reduced to two hours.

RESULTS AND DISCUSSIONS

The quality of processed wheat.

For this experiment we took type IV autumn wheat from the 2008 crop, with 14% average damp, 1.71% ashes, 53% glassy, gluten 27.8%, starch 66.04%.

Because the quality indexes of the grains at the experimental mills were almost the same as the ones for control, the result of the grinding depended only on the conditioning

method.

At the experimental mills, at the passing by schrot I the average grain humidity 0.1% bigger than the humidity at the control mills (where the conditioning was made at low temperature). This means that the technology of the quick conditioning process allows damping standard maintenance typical for wheat preparation for grinding with the help of washing machines.

Yet, we must emphasize that in the quick conditioning process dampness assigns differently, especially in the periphery of the grain. This is shown by the difference between the dampness of products obtained from superior bolters and the humidity of the flour from the same passing. So, after passing schrot I the flour humidity is higher with 0.06%, after passing schrot II it was lower with 0.3%, after passing schrot III it was lower with 0.63%, after passing schrot IV it was lower with 0.76%, after passing schrot V it was lower with 0.33% and after passing schrot VI it was lower with 0.09%. As we see, after passing schrot I the flour damps from the seminal layers of the grain with which is milled and at the other passes product humidity from the superior bolters it is always higher than the humidity of the flour.

The average ash content in the grains at the experimental mills was with 0.02% lower than at the control mills. This difference, though small, shows that the quick conditioning process creates conditions for better wheat cleaning.

The quantity of black foreign objects including weed seeds was the same at both the used methods and the content of white foreign objects at the quick conditioning method was lower with 0.09%, proportion for broken grains was also lower with 0.12%. This explains through the fact that quick conditioning gives grains more elasticity and for that reason the grains are less harmed during the washing and cleaning process.

Grain glassiness at the passage by schrot I went down with 16.4% at quick conditioning and with 12.1% at cold conditioning. The maximum glassiness drop (23.1%) was obtained through the quick conditioning method. This method has more intense effects on the grain's structure. We must acknowledge the fact that in the quick conditioning method the glassiness indexes are more even and that means that this process levels better the glassiness bakery proprieties of the wheat and through this creates positive premise for milling stability.

The glassiness drop of the wheat observed above can't be seen as a worsening of the milling proprieties of the wheat.

On contrary the semolina and refined semolina is bigger and of better quality.

What gluten weight after passing schrot I didn't practically change but a gluten specific extensibility reducing was made. It was more increased at the quick conditioning method.

Wheat grinding indexes. Extraction from the schrot passages with which the milling process is characterized was: at schrot I passage from 17 to 26%, at schrot II passage from 52 to 64%, at passage from schrot III from 59 to 72% and at passage schrot IV from 71 to 86%. There wasn't a notable difference between the indexes at the experimental mills in comparison with the control mills. So we can say that the quick conditioning method allows the insertion of the milling regime for the specified wheat.

Rated capacity and quality of the semolina and refined semolina determined on the foundation of collected samples at semolina balance sheet. Besides this, there were made mills balance sheets for the grains that were in a damp environment a different period of time. The data showed that in case of the quick conditioning method the best results regarding the rated capacity in large, small semolina and refined semolina and also regarding their quality were obtained in the case when grain dampening lasted three hours. In this case the rated capacity of semolina and refined semolina was 71.9% with an average ash content of 0.74%. At the control

mills where the grains were submitted to cold conditioning and the damping lasted 22 hours the semolina and refined semolina products were 70.1% with an ash content of 1.05%.

Superior quality flour extraction from the wheat submitted to the quick conditioning process was56.2% and the general extraction was 81.7%.

From the cold conditioned wheat we obtained 50.3%superio quality flour and the total extraction 80%.

Applying the quick conditioning method contributed to the growth of superior flour extraction.

Flour and husk quality. In the experimental mills the dampness degree of superior flour was 14%, of first quality flour was 13.8%, of second quality flour was 13.7% and the husk had a dampness factor equal to 12.6%. At the control mills the dampness degree was the same. The drop of husk dampness in comparison with flour dampness is characteristic for the mills equipped with pneumatic based transportation.

At the experimental mills the ash content of superior flour was 0.6% and the ash content of the entire quantity of extracted flour was 0.75%, while at the control mills the ash content was 0.59% and respectively 0.82%.

The ash content at all types of flour was bigger with 0.02 – 0.03% at the control mills. According to VNIIZ colorimeter the color of the superior flour from the experimental mills is 2.8 units, the color of the first quality flour was 14.7 units and the color of the second quality flour was 60.3 units; the color of regular flour from the control mills is respectively 2.5, 18.5 and 66.3 units.

The conditioning method did not exert any influence on the size of the flour particles.

The gluten content in the superior flour and in the first quality flour was almost equal and in the second quality flour was lower with 2 – 3% at the control mills. The analysis of gluten quality appreciated through determination of the specific extensibility showed at the experimental mills that the gluten hardened. So for the superior flour this index is 0.23 cm/min, at first quality flour – 0.27 and at the second quality flour – 0.29 cm/min and at the control mills respectively 0.29, 0.44 and 0.38 cm/min.

Volume and color of brad were determined after obtaining the laboratory baking data. The results showed that bread volume is almost the same at both methods of wheat preparation being a little bigger at the control mills. The proportion between the heights of the hearth baked bread in concordance with its diameter got better when using quick conditioning. Generalizing the data above and the result of numerous observations from the experimental mill after applying the quick conditioning process we can say that steam treatment combined with the heating and drying of grains allows the regulation of the water content in the grains so much so that we can obtain the best milling proprieties of grains and a raise in flour quality.

CONCLUSIONS

The research showed that the quick conditioning method, being an intense process, it has a systematic control and when applying this method, one must have precise and obvious knowledge of the processed wheat. Steam treatment of wheat deserves application on a large scale at systematic mills with high quality grinding.

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