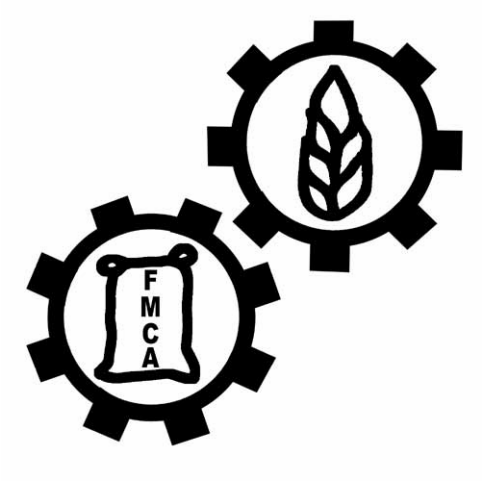

REPORT

Addition of Folic Acid to Flour for Making Bread

February 2007

by

Richard Eliott

Executive Summary

This report is a review of the feasibility of addition of folic acid to flour in Australia for making bread within specific high and low tolerance levels (2.30 -2.80 grams per 1000kg) and the consequent cost implications. This flour is a multi purpose flour and is generally referred to as Bakers Flour.

Currently in mills all over the world various additives are added to flour, principally Thiamine, Creta and Iron, via varying forms of feeders **where a minimum level of addition is required with no enforced maximum level**. The result of this is that in order to meet the minimum requirements more additive than is required to meet the minimum standard is added. This was identified by FSANZ in the Draft Assessment Report, 3 July 2006 (attachment 4), in reference to the US experience. This overage is due to the inability of various feeders traditionally used, to accurately dispense the required amount of additive to the flour stream during milling which is subject to variables in the milling process and to extractions required to produce a range of specialty products during production.

In the case of Folic Acid, with the very narrow band of tolerances proposed, current methods are fundamentally inadequate and cannot be relied upon to meet the tolerance criteria. The traditional flour milling process relies on high volume throughput and is not designed for micro ingredient addition.

It is for this reason that millers must use expensive small batch mixing (0.5 – 2.0 tonne) of weighed ingredients to produce the existing improvers and total ingredient mixes which contain the micro ingredients for use by the baking industry. Some of the enzymes used are added at the low levels required for folic acid. This labour intensive operation (1 – 2 Tonnes per hour) compares with flour production average of 11 tonne per hour with a number of mills at double this volume.

The narrow tolerance band proposed for addition of folic acid to flour requires a completely new manufacturing facility to be built and incorporated after the existing

milling process to prepare flour to go to bulk storage for packing, blending or bulk delivery. The available method of testing to confirm correct ingredient addition incurs a time delay for test results to provide positive clearance of product and therefore a consequential need for holding storage capacity. Other operational factors which must be provided for include, the mixing back of reject flour which includes both non folic acid flour and bakers flour (which includes previously added folic acid).
The miller is confronted with considerable operational challenges of integrating a supplementary system which must conform to a continuous 24 hour operation without hindrance to supply capability to a multitude of customers who expect a just in time service demanding complex logistical programming.

In addition to the cost of providing such a facility, the interruption to operation given the integral linking to the existing mill facility plus the additional resource to operate the plant including specialist quality control testing (largely eliminated in many mills) represents further significant cost consequences.

The projected estimated cost to the Australian Milling Industry for the addition of Folic Acid at the indicated tolerance range, represents an initial capital cost of some $A22.1 million with an annual ongoing cost of some $A11.9 million p.a.

This impost on the Industry is likely to result in the closure of a number of the smaller operators and promote further rationalisation in the industry and have a major impact on the cost of flour for making bread. In year one the capital cost plus operating cost on average could be $45 per tonne of flour.

As an example in canvassing opinion in the industry a smaller miller with aligned bakery (total employment 90 persons) has estimated the cost base relevant to larger competitors to be a minimum $27 per tonne price disadvantage. This is due to non proportionate cost based on a large differential tonnes per hour in mill throughput, (lesser tonnage to recoup cost). “Based on the best information available at this time (we) the owners would be forced to exit the industries”.

Table of Contents

Project Description

To review the feasibility of addition of folic acid to flour for making bread in Australia, within specific high and low tolerance levels (2.30 -2.80 grams per 1000kg) and the consequent cost implications.

Scope

The scope of this review deals with the addition of folic acid to flour for bread making as defined in the Australia New Zealand Food Standards Code (the Code) as:

" flours or meals means the products of grinding or milling of cereals, legumes or other seeds" (Standard 2.1.1)

Flour for making bread is not further defined in the Code.

Project Background

The Flour Millers Council of Australia contracted Mr Richard Eliott from Milling Consulting Services Pty Ltd as an independent and internationally recognised expert in technical flour milling, mill construction and plant installations to prepare this report on behalf of the milling industry.

At the time of the FSANZ Draft Final Recommendation the industry was confronted for the first time by the proposed controlled tolerance of addition of folic acid. This was specified as the strategy to reduce the health and safety risk applying to some segments of the population due to excessive folate intake. The industry immediately recognised the implication of this, and in haste, given the limited response time allowed for submission, replied with an estimated cost to the industry.

The purpose of the current project is to provide the detail that was recognised at the time but unable to be properly assembled, including the capital and mill operating costs.

Each member of the FMCA has been involved in consideration of this report and each confirms the fundamental principles for there own operations. It is simplistic to suggest that a single installation would meet the requirements at all flour mills, rather the solution would have to be refined and tailored to each situation.

The members companies of FMCA (appendix K) are joined by Allied Mills Pty Ltd and Manildra Group in recognition of the implications of the proposal for mandatory fortification of bread making flour and as a result oppose the proposal.

Introduction

In giving consideration to this proposition, one has to take account of the varying complexity of Australian mills and the wide range of flours produced and the divide flours that are made, often lower grade flours being separated from the main stream, which is subsequently metered back into Flour for bread making, and this will vary from mill to mill.

This being so, it is not possible to design a panacea solution for all mills, so a basic principle must be selected which will require modification in various details to respond to the idiosyncrasies and capacities of each individual plant.

Currently in mills all over the world various additives are added to flour, principally Thiamine, Creta and Iron, via varying forms of feeders **where a minimum level of addition is required with no enforced maximum level**. The result of this is that in order to meet the minimum requirements more additive than is required to meet the minimum standard is added. This is the result of the inability of the various types of feeders traditionally used to accurately dispense the exact required amount to correspond to the flour stream which itself may be subject to fluctuations.

In the case of Folic Acid, with the very narrow band of tolerances proposed, current methods have serious shortcomings and cannot be relied upon to meet the tolerance criteria.

With the very narrow tolerance band proposed and the available method of testing and the time taken to undertake such tests and therefore consequent holding storage capacity, together with the problems arising from mixing back any Flour for bread making returns with previously added Folic Acid, the miller is confronted with a very considerable challenge with very significant cost consequences.

In most cases, particularly mills in the higher capacity range, it is likely that a premix facility will be required to provide the quantity and quality of premix to meet the Flour for bread making production needs. Mills without premix plants will have to buy premix from others at a price disadvantage as the capital cost of such a plant will be in the order of $192000.(see appendix D and diagram 001)

Furthermore the cost of appropriate testing equipment to ensure conformity to the tolerance range being in the order of $257000 (see appendix E), places a further burden on all millers. Such costs referred to above do not include ongoing labour,

running, maintenance or interest costs, all of which are included in the final estimate of costs later in this report.
Arising from all the above, FMCA approached the writer, as an independent Consultant to the Flour Milling Industry with hands on experience in more than 10 Countries with the majority of experience being in Australia and New Zealand, to investigate methods and produce estimates of the costs associated with this matter.

This report has been produced for Australian mills however it almost certain, although beyond the scope of this submission, that the findings could, in principle, be applied to mills in other countries which had to comply with the prescribed fortification requirement.

Description of the Industry

There are 28 mills in Australia with a capacity range as follows:

Flour Tonnage/hour	Number
0.5-5	9
6-14	12
15 +	7

The industry produces 764,000 tonnes of flour for bread making per annum (identified in the industry as Bakers Flour).
These statistics are for year ending June 2006 and are collected by the Australian Bureau of Statistics as contracted by the Flour Millers Council of Australia.
It is noted that this tonnage of flour does not necessary relate well to flour usage by Bakers due to the millers Bakers flour category being a generic category and the difficulty in getting reliable statistics for the baking industry in Australia.

Methodology

As stated above, this report centres on basic principles which would have to be tailored to individual plants and capacities. It became evident whilst investigating this matter that not only was there no panacea but given the varying range of size and complexity of mills that for smaller less complex facilities a method of addition in the mill had to be devised Option A. (see appendix A and diagram 002) and for large more complex plants addition in the bulk storage facility may be the preferred method Option B.(see appendix B and diagram 004).
In both cases a premix plant or in the case of smaller mills access to one is required. The premix would have to have a concentration of carrier (assume flour) and Folic Acid in sufficient proportions to facilitate addition rates within the capabilities of the metering devices used.
For this purpose it has been assumed that the addition rate will be 30 grams/tonne of flour produced, consisting of 27.5 grams of flour and 2.5 grams of Folic Acid (the

mean between 2.3 & 2.8 grams).
Therefore the addition rates for varying sizes of flour production will be:

30tph 900 grams/hour or 21.6 kg/day
20tph 600 grams/hour or 14.4 kg/day
10tph 300 grams/hour or 7.2kg/day

Based on this premix formula it means that 22.92 tonnes of premix containing 1.909 tonnes of Folic Acid will be used by the industry. (764000 x 30 grams =22920000 = 22.92T x 8.33%).

The typical premix plant (diagram 001) would consist of a S.S. 500kg mixer into which ingredients will be manually tipped feeding as S.S. floveyor feeding a S.S. surge bin above a packer. The plant would have an exhaust system and dust collector with a simple electrical control panel. The plant envisaged would produce some 1.5 tph of premix if a 2 man operation otherwise approximately 750 kg/hr if 1 man operation.

Option A (Smaller Mills)

In this case the dosing plant (diagram 002) requirement would consist of:

1) A bin receiving Flour for bread making from the mill. The means of getting flour into this bin will vary from mill to mill but it is assumed it will be beneath the flour collecting conveyor. The bin is located above a Transflowtron loss in weight scale for accurately metering the flour into the mixing conveyor on account of the fact that there can be fluctuations in the flour stream. The bin will be fitted with high and low level devices controlling the operation of the dosing device in 2) below.
2) A reserve bin with a low level alarm located above a loss in weight micro proportioning scale dispensing the premix into the same mixing conveyor as in 1) above.
3) A special mixing conveyor of sufficient length to achieve an homogeneous mix.
4) As such a system will be incompatible with the existing plant the mixing conveyor will feed a blowing line to take the flour to the point where the existing system

takes over. In such a plant that falls within the category of Option A it is assumed that as normally “green” flour is not immediately despatched and sufficient time will exist (24 hours) for the flour to be tested for Folic Acid content in addition to any rheological testing. The blowing line will consist of a rotary seal, blower and transit separator and filter and seal.

5) As most mills are making divide flours (less Folic Acid) for speciality production such flours are usually fed in controlled amounts back into Flour for bread making. This being so provision for such flour to be fed into the bin in 1) above at a controlled rate must be provided to ensure they also receive the appropriate addition of Folic Acid.

It should be noted that the system described above will be separate to any existing system as the existing system will be used for the production of all flours other than Bakers.

The type of challenges that face the miller in the case of this option relate principally to:

6) Flour for bread making produced as described above that are out of spec. either from a quality point of view or from a Folic Acid viewpoint.
7) Flour for bread making returned from outside sources. In both these cases the flour cannot be returned to the above system as double dosing of Folic Acid will result thus exceeding the maximum tolerance level, so a method of mixing back such flours into non Flour for bread making has to be available. (Normally returns are metered back into the system at a low rate). This would involve an extension to the existing returns system to enable Flour for bread making to be sent to non Flour for bread making facilities for mixing back into flours having a lower sales value than in its original form. (see appendix C and diagram 003).

Such a system as a minimum would consist of:

8) A diverter valve introduced into the existing return conveying system directing the product to a transit separator.
9) The transit separator will feed a holding bin fitted with high and low level controls

10) The bin will also be fitted with a bin activator and variable speed screw feeder feeding a blowing line.
11) The blowing line will blow to a transit separator that will feed to the existing non Flour for bread making system for mixing back.
12) A general exhaust system.

Option B (Larger Mills)

Inevitably in this option there will be a very wide variance in the facilities in each mill dependent on range of flours produced and logistics within the plant. Some plants will have batch weighing of flours to reach a particular spec. and others will have continuous blending systems. Therefore in an attempt to identify a solution that is near to common as possible it will be necessary to dose the Flour for bread making at a point in the flow prior to packing or being transferred to bulk delivery bins (diagram 004).

Given the time required to undertake the test (in practical terms this amounts to an absolute minimum of 24 hours) to ensure the level of Folic Acid is within the narrow tolerance range specified, additional bulk storage facilities will have to be provided for holding purposes before the flour can be despatched to packing or bulk outloading facilities.

It is envisaged that this would entail the Flour for bread making, once blended or drawn from the bulk flour bins, will then be directed to a transit bin and a facility similar to option A namely:

13) A Transflowtron loss in weight scale for accurately metering flour into a mixing conveyor. The bin will be fitted with high and low level devices controlling the operation of the premix dosing device.
14) A reserve bin with a low level alarm located above a micro proportioning scale dispensing the premix into the same mixing conveyor as in 14) above.
15) A special mixing conveyor of sufficient length to achieve an homogeneous mix.
16) As such a system will be incompatible with the existing plant the mixing conveyor will feed a blowing line to take the flour to the additional holding bins awaiting testing. Realistically such bins would have to have a capacity equal to a minimum of 32 hours of packing or outloading capacity. This additional facility would then have to have means of blowing to the existing packing or bulk outloading transfer systems.

It is likely that the facilities in this option would be handling up 30 tph.

Implementation

In either of the options A or B there are varying degrees of very substantial capital and running costs ranging from premix plants, dosing facilities, conveying equipment, transit and holding bins, testing equipment and associated costs relating to new, and modification to, control systems and no doubt in some cases alteration to existing buildings or the erection of new ones. The writer has of necessity had to take an “average” position as of course the implementation will significantly vary from mill to mill.

Testing for Folic Acid

As stated earlier the cost of setting up to test for Folic Acid is significant and each individual Miller or group will have to give careful consideration to this for the following reasons:

A) The need to ensure their flour conforms to any mandatory standards and the threat of possible litigation in years to come with any over dosing.

B) The time to undertake testing (a 9-10 hour period) which poses logistical problems from the point of view of holding flour awaiting confirmation of acceptance, for example the miller starts a 12 hour Bakers Flour run at 4pm (day 1) and runs until 4.a.m. the following day (day 2) with samples taken hourly. The flour produced at 5 p.m. on day 1 will not be verified until say 6 p.m. on day 2. (this assumes the lab. starts work at 8 a.m. the following day (day 2) and the first test of the run will be completed 10 hours later say 6 p.m. The flour milled at 4 a.m. (given that there will be 11 samples to be tested before it can be verified), will not be verified until some 50 hours after the run commenced.

C) Storage capacity of finished product etc

D) The logistics of production planning in relation to testing location (if off site due to relying on others).

E) Weekend running.

Attached are flow diagrams depicting very simplistically:

Premix Plant # 001
Dosing system option A #002
Dosing system option B #004
Returned flour system #003

Costings

Assumptions

In producing the estimated cost figures to the industry of this proposal the writer has made the following assumptions:

1) That only 27 mills produce Flour for bread making and therefore will have to have one or other form of dosing facility that can achieve the narrow level of tolerance. Assume 20 mills in category A and 7 in category B.
2) That all 27 mills will have to have, or have access to, Folic Acid testing facilities near to hand. Assume 19 mills provide their own testing facility.
3) That not all mills will have the means of accepting returned Flour for bread making that allows such returns to be mixed back into non Flour for bread making. Assume 13 mills have to provide new returns facilities.
4) That the majority of mills will not be able to justify making their own premix and unless they already have a **suitable** mixing plant (given the small quantity of Folic Acid/mix a very efficient mixer is required) then they will have to buy in from others. Assume 2 mills have to acquire their own premix facility.
5) That mills which fall into category A have adequate means for storing Flour for bread making for the time taken to undertake Folic Acid testing. Where this is not the case additional capital cost will be incurred which has **not** been included in the estimated costings.

Conclusion

As will be seen from the foregoing and the attached **Summary Document** (supported by appendices A-F) the projected estimated cost to the Australian Milling Industry, for the addition of Folic Acid in the currently canvassed format, represents an initial capital cost of some $A22.1 million with an annual ongoing cost of some $A11.9 million p.a.

This impost on the Industry is likely to result in the closure of a number of the smaller operators and have a major impact on the cost of flour for making Bread.

Attachments

Appendix A: Option A Dosing System

Appendix B: Option B Dosing System

Appendix C: Return Flour System for Bakers Flour

Appendix D: Premix Plant

Appendix E: Testing of Folic Acid

Appendix F: Premix Costings

Appendix G: Basis of Costings

Appendix H: Summary of Costings

Appendix I: Richard Eliott CV

Appendix J: Flow Diagrams

1. Premix Plant # 001
2. Dosing system option A #002
3. Dosing system option B #004
4. Returned flour system #003

Appendix K: FMCA Member Companies

- Cummins Milling Company P/L
- Laucke Milling Company
- Millers Foods
- Tasmanian Flour Mills Pty Ltd
- Weston Cereal Industries
- Young Roller Flour Mills