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**affiliated to the American
Society of Baking**

Conference Proceedings 2009

British Society of Baking

British Society of Baking Conference 2009

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Chairman Andrew Pollard



Good morning ladies and gentlemen. Welcome. As I said last night, we are very pleased to welcome some new members, some returning members and obviously some guests that we have not seen before, so a very big welcome to anyone joining us for the first time. For those of you who were here last night I hope you enjoyed the meal and entertainment. As you know we

are trying out a new conference format and we would be grateful for any comments you might make in terms of the hotel, the slightly different format, the number of speakers etc. So please let us have your feedback. As you can see from the programme we have a list of excellent speakers who I am looking forward to hearing. We also have our own Keith Houliston and Sara Autton as sessional chairman and I am sure they will keep everything under control. But as always I must thank Jim Brown and Sharon Byrne for the work that they do behind the scenes.

Could I now welcome Past Chairman Colin Lomax, who has kindly agreed to read the Society's Creed and thereafter Keith Houliston will act as Sessional Chairman for the morning Sessions, with Sara Autton taking over as Sessional Chairman for the afternoon sessions.

The Society's Creed

As a member of the British Society of Baking it is my desire and aim...

To promote the ideals of fellowship, enlightenment and inspiration for which the Society stands.

To endeavour to be free with and to encourage the exchange of information on baking subjects among fellow members.

To encourage the highest standards of training and education within our industry.

To promote the highest possible standards of service and product quality.

To remember at all times that I am concerned with one of the oldest and most honourable of crafts and with the production of one of the most important of all foods.

Sessional Chairman Keith Houliston

Thank you Mr Chairman and good morning to you all. We are delighted to have for our first speaker, Graeme Chaplin. Graeme is the Bank of England's Agent for the West Midlands and Oxfordshire. He acts as the eyes



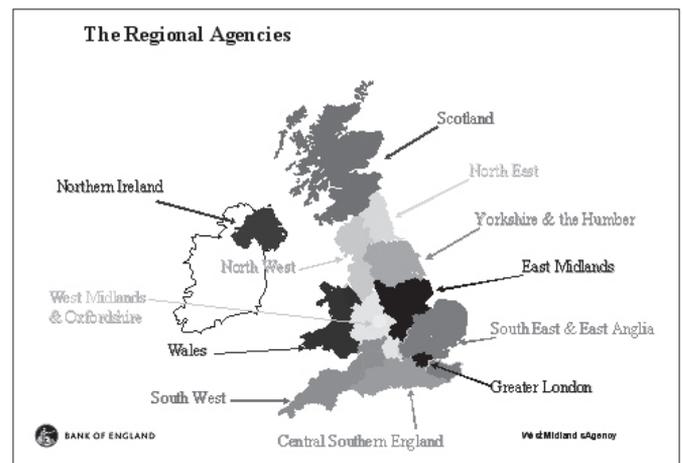
and ears of the Monetary Policy Committee in the region, as one of twelve Agents throughout the country. It is Graeme's job to collect an up-to-date picture of the economic outlook for the MPC which inputs to the Bank of England setting the interest rate to meet the inflation target figure of 2% on the Annual CPI measure. The current financial crisis is a very topical subject at present which has, and is, affecting everyone in this room. We look forward to Graeme's paper which will include the impact the credit crunch has had on the UK economy. Ladies and gentlemen please welcome Graeme Chaplin.

The Credit Crunch Graeme Chaplin



Good morning. My name is Graeme Chaplin and I am the Bank of England's Agent for the West Midlands. My role as Agent is to act as the eyes and ears of the Bank's Monetary Policy Committee (MPC), speaking to a broad cross section of businesses throughout the region in order to take the economic pulse and feed back that timely information to the MPC.

Today I will be providing a brief overview of the outlook for the UK economy. I shall begin by considering the backdrop to the current recession, specifically the origins of the global credit crunch and the public policy response. This will include a few words about Quantitative Easing - what it is and how it operates. I shall then consider the global economic outlook, turn to credit conditions within the United Kingdom and then consider the current and future prospects for the UK economy, especially in terms of activity and inflation.



Regional Agencies of the Bank of England

So, what is the Credit Crunch, why did it occur and why is it important? Well, to take the last of these questions first, lack of credit is constraining investment and growth across many sectors of the economy. So how did we get here? The past decade has seen unparalleled growth in global credit. This growth was driven to a large extent by rising activity and wealth in emerging market economies, generating high levels of savings which were channelled into Western economies. This supply of credit reduced the cost of borrowing but also rates of

return on various asset classes. As a result there was an increasingly enthusiastic search for yield amongst investors. Financial institutions cooperated by generating complex instruments which appeared to generate higher yields without increasing risk. In hindsight it is obvious that the connection between risk and return had not broken down. As a result, when certain asset markets, not least the US sub-prime mortgage market, turned down it was apparent that risks had not been priced correctly within the financial system and there was severe institutional distress as a result.

This can be illustrated by the increase in the costs which banks had to pay to borrow from one another. During the time of the Northern Rock crisis and then once again in the autumn of 2008, around the time of the failure of Lehman Brothers, the spread between the London Inter-Bank Offer Rate (LIBOR), the rate at which banks borrow from one another, and Bank Rate, the rate at which banks borrow from the Bank of England, widened dramatically. This simply illustrated the risk which banks now perceived in lending to and borrowing from one another. This spread remains at a relatively high level indicating that confidence has not yet returned fully to the banking sector. So what measures have the Bank and the Government taken to



The famous Bank of England Headquarters in Threadneedle Street, London

try and alleviate these problems? Firstly, there has been a major Government-supported recapitalisation of the UK banking system, not least the investments in Lloyds and RBS. The Government has also stepped in to guarantee the issue of new short and medium term bank debt and of certain asset backed securities. Most importantly, the Government has created an Asset Protection Scheme which effectively underwrites a proportion of the loans currently on the books of Lloyds and RBS. This allows those banks to draw a line under the potential losses from these loans and so focus on new lending. In fact, the Asset Protection Scheme has significant conditionality attached. Lloyds have been asked to lend a further £14bn and RBS a further £25bn in order to participate in this scheme. Finally, the Bank itself has been injecting liquidity into the banking system through expanded market operations and it has also undertaken Quantitative Easing, of which more in a moment. The purpose of all the public action is to promote credit creation by the banks. As noted, the Asset Protection Scheme requires Lloyds and RBS to lend more. In addition, Northern Rock is no longer running down its mortgage book, but rather seeking to generate new lending.

I shall pause now briefly to describe Quantitative Easing. The Bank has announced its intention to purchase £125bn of assets

financed by the creation of central bank reserves. The purpose of this is to boost the money supply, ease conditions in corporate credit markets and thus hopefully increase growth in nominal demand and put upward pressure on retail price inflation.

Turning to the World economy. There was a sharp and synchronised downturn in global economic activity in Q4 2008 which continued into 2009. This reflected a collapse in consumer and business confidence and the decline in credit availability, leading to reduced consumption and particularly a reduction in investment spending. The latest IMF forecasts for GDP growth in 2009 make bleak reading. The IMF expects World GDP to fall by 1.3% in 2009. If that were realised it would be by far the deepest global recession since the Second World War. The most recent survey indicators suggest that the pace of contraction in global activity may be moderating somewhat and the depreciation of sterling has helped to increase the UK's share of global trade. However, on balance, the contacts spoken to by the Agency network suggest that the outlook for exports from the UK remains subdued due to low global trade demand.

Turning to the UK economy, one of the key measures being monitored by the MPC is the state of credit conditions within the UK. The Bank publishes a monthly Trends in Lending Report which sets out information on Bank lending to UK corporate bodies and households. It also undertakes and publishes a quarterly Credit Conditions Survey, of UK bank and non-bank lenders. Drawing on these data it is clear that lending growth remains very weak, in part reflecting the withdrawal from the UK of some foreign based banks and smaller UK lenders. Simultaneously the demand for loans has fallen as the economy has slowed. The most recent Credit Conditions Survey suggests that the supply of lending to and demand for lending by, larger UK corporate companies is increasing during Q2, as is the issuance of debt and equity. But among SMEs credit is difficult to obtain and that the cost of that credit is increasing, especially with regard to fees. In the household sector the picture is similar with weak lending growth and the withdrawal of foreign based banks coupled with a softening of demand. That said, mortgage rates have undoubtedly fallen, despite rising spreads, reflecting the sharp cuts in Bank Rate. This may perhaps account for the fact that leading indicators for the housing market suggest that there are some signs of recovery, although levels of activity remain weak.

So what does this mean for the UK economy as a whole? GDP continued to fall sharply in the first quarter of 2009, but there are promising signs that the pace of decline has begun to moderate. The fall in output in the six months to March was the largest since quarterly data began in 1955. Moreover this is an across-the-board recession affecting all sectors of the economy. However, more recent data from surveys and from the Bank's Agents indicate that the pace of decline has begun to moderate in almost all sectors, although levels of activity are well below those seen this time last year.

Retail spending has been buoyed by lower mortgage interest payments but remains constrained by concerns around future unemployment and low levels of wage increases. Investment expenditure has been extremely weak across all sectors during this recession and survey data indicate continued weak investment intentions due both the demand uncertainty and tight credit conditions. In contrast, Government investment

spending growth has remained positive so far and more short-term discretionary measures are anticipated during the coming fiscal year. But Government borrowings will rise as a percentage of GDP going forward and this deficit is likely to be a drag on economic growth in the medium term.

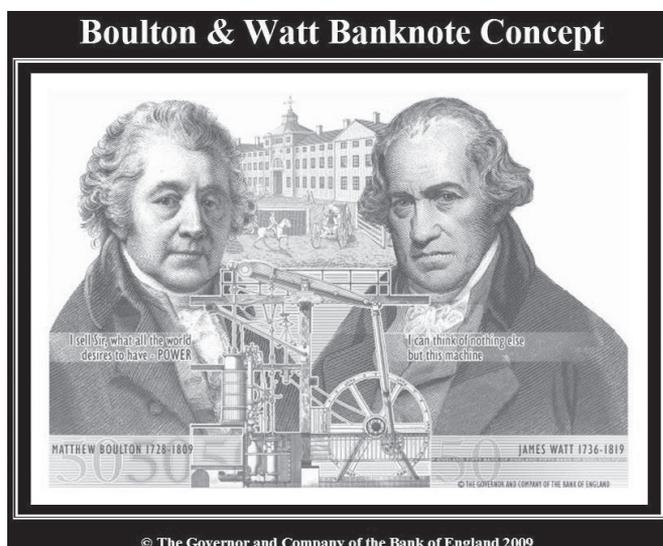
As a result of this subdued outlook for activity, the labour market remains weak. If previous recessions are any guide, the rate of unemployment is likely to continue rising even when GDP growth returns to positive territory. This is a concern to the MPC, as unemployment growth is likely to act as a drag on consumer confidence and therefore on expenditure. That said, Agents' contacts have reported an increased degree of flexibility among the labour force in terms of taking wage cuts and operating flexible hours in order to reduce the increase in unemployment.



The Bank of England's Monetary Policy Committee, with in the centre, its Chairman Mervyn King, Governor of the Bank of England

Turning to retail price inflation, the current CPI measure which is targeted by the MPC, remains dominated by the sharp increase in fuel and food prices seen during 2008. But as these unwind through the remainder of this year we anticipate that inflation will fall back below our 2% target. It is noteworthy that RPI is now in deflationary territory, reflecting the sharp falls in mortgage interest payments due to the cuts in Bank Rate. Looking ahead, the prospects for growth and inflation are conditioned by two balancing forces. The significant global public policy stimulus which has been injected into the economy is pushing against the significant fall out from the financial crisis. As a result the strength and timing of the recovery are more uncertain than usual. In terms of economic output we are forecasting a slow and protracted recovery with the pace of decline moderating at present. In the short term growth will be boosted by the stock cycle, as de-stocking in most industries now appears to have come to an end. The monetary and fiscal stimulus in place should also boost growth, as will sterling's depreciation. But growth is unlikely to be rapid in the near term, as the restoration of credit flows from the banking system will take time. Finally, in the UK there will be a significant drag on growth going forward from the fiscal deficit.

The impact of all of the above on inflation is highly uncertain: but is more likely than not that inflation will be below target for the next two years. This is primarily due to the fact that there will be a large amount of spare capacity in the UK economy, even when we return to positive annual growth, as the level of output will remain subdued for some time.



Design for the next £50 note featuring Matthew Boulton and James Watt

Nonetheless, I remain optimistic that the West Midlands will be able to come out of this recession well positioned. You may be aware that the new £50 note, due to come into circulation in 18 months time, will carry pictures of James Watt and one of Birmingham's most famous sons, Matthew Boulton. And the type of ingenuity and entrepreneurial spirit personified by Boulton is alive and well within the region. I continue to see many contacts with innovative, successful products who I have no doubt will thrive, as long as we in the public sector provide the economic stability for them to do so. Thank you

Questions and Answers

Question: Chris Beaney, NAMB

Is it the intention that the nationalized banks should repay the money back to the Government eventually and obviously become independent again or will it be long term nationalization?

Answer: I don't think anyone expects the institutions to remain nationalized long term and the repayment schedules will be a function of how the economy and the various financial markets operate.

Question: Andy Pollard, East Yorkshire

As Gordon (Brown) sold all the gold off, all this quantity of easing, is it a worry? How do we pay for it all if we have no gold reserves left?

Answer: We haven't had a link between gold and money for decades. The note issue is a fiduciary issue which means that it is backed by holdings of high quality government debt and high quality blue chip debt. So there is no direct link between gold holdings and the Bank's creation of money any more, there hasn't been for many years, so no, that is not a direct concern.

Question: Sylvia Macdonald, Croydon

The FSA has lost so much credibility in the last year. Would you like the Bank of England to be in a position to wrestle back some of the regulatory measures that it had?

Answer: I can't possibly comment on that.

Question: Peter Jones, Cheshire

What's the Bank of England's prediction for interest rates over the next two years?

Answer: I'm glad you asked that question, as the really honest answer is that we don't make predictions on interest rates because it would be totally circular. If we were to do that the predictions would get priced into markets and we would then have to make decisions that didn't fit with our predictions etc. We are very clear that what we do is we sit down every month and make a clean decision based on what has come through in that month compared with what we were expecting beforehand. Now the markets take a view about what we are going to do with interest rates and hopefully we provide them with a huge amount of information. We are totally transparent about how we make our decisions and hopefully there aren't any surprises in how we make our decisions given the data, and it's very rarely that we have actually surprised markets with our interest rate decisions. So if you look at market expectations for our decisions that's as good a guide as you'll get I think. But the fact of the matter is of course that things change on a monthly basis. Various members of the Monetary Policy Committee have given opinions on the length of time for which we might have low interest rates, so I could refer you for example to Paul Fisher's speech last Friday where he talked about that topic, but it's not something that makes any sense for us to forecast.

Sessional Chairman Keith Houliston

Once again Graeme we thank you very much for coming here today to give your valuable time to attend our conference and can I say on behalf of all the delegates it has been a worthwhile and interesting paper. Thank you Graeme.

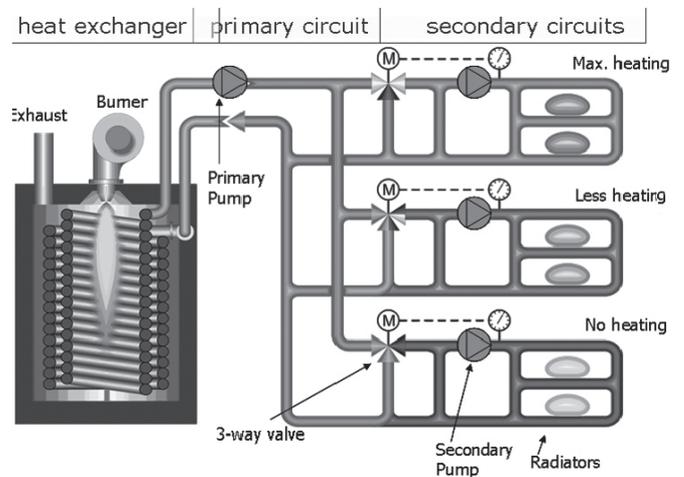
Our next speaker is Gerd Meyer of Daub Ovens, who will present a paper on the operation and energy efficiency of bakery ovens. His paper will describe the thermal oil system as a method of transferring heat from the oven burner to bakery products in deck and tunnel ovens. He will demonstrate the advantages the system has on the quality of baked goods and reducing energy consumption and how it can be environmentally friendly, giving less pollution. He will also cover waste heat recovery. Gerd comes from a bakery background in which his parents ran a small craft business in Hamburg, Germany. He qualified as a Process Engineer and was awarded a Doctorate in thermal engineering. Gerd spent twelve years in the textile industry and has been with Daub for eleven years. We are delighted that Gerd has come especially from Hamburg to make his presentation, which we appreciate. Ladies and Gentlemen Dr Gerd Meyer.

Operation and Energy Efficiency of Bakery Ovens
Dr Gerd Meyer



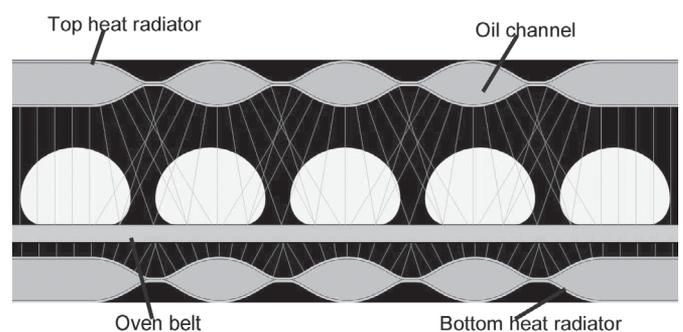
My intention today is to give you some information and maybe some ideas to promote baking excellence with ovens heated by thermal oil. Daub is a small family owned company in Hamburg founded in 1938 and for approximately 40 years we are installing thermal oil ovens. In that time we have installed roughly 38 thousand m² in baking surface ovens and this equates to

approximately 12 tonnes baked goods per day. Thermal oil systems sounds a little bit complicated. However everybody knows the house central heating system and we are using more or less the same. We use a burner and heat exchanger, together with a pump for the flow of the hot fluid. Instead of water this fluid is thermal oil because a higher temperature level is required. That's the only difference. The rest is more or less the same as in a standard house central heating system.



On the oven we have, what we call, secondary circuits, again pumping around the thermal oil. From the heat exchanger comes just the amount of oil you need to keep the required and adjusted temperature inside your oven. The advantages of such a system is you can provide the energy from one heat source (burner and heat exchanger) for different ovens working on different temperatures or for zones just in one oven working at different temperatures. Inside the oven the product sits on a belt or on trays. The heat transfer to the product will be from a top radiator and a bottom radiator. We are baking by radiation. These radiators have thermal oil inside and we just do a soft heat transfer to the products by radiation. The advantage of this system is that you can influence top and bottom heat in all zones of the oven individually to achieve an even and consistent bake result.

What we aim for is to improve that bake result with the thermal oil system. Therefore we create a certain surface on the radiators. The reason to do this is to extend the radiator surface because more surface area means more heat transfer by radiation to the product. Radiation will be also determined by temperature difference between thermal oil and bake chamber temperature. Improving the surface means we can reduce the temperature in the thermal oil to achieve the same heat transfer to the product. This saves energy the lower temperature gives less heat loss through the oven body and flues.



RADIATOR MATERIAL AND SURFACE COATING – EFFECT ON COEFFICIENT OF RADIATION		
Radiator Material	Coefficient of Radiation (W/M ² K4)	Correlation with black radiator
Black Radiator	5.67	100%
Steel with glass coating	5.1	90%
Used Oven Stone	4.8 – 5.0	85 – 88%
Steel with oxide coating	4.5 – 5.0	79 – 88%
Steel with ceramic coating	4.7 – 4.9	83 – 86%
Steel – new and unused	3.69	65%

We also have a coating of the radiator surface in order to get as near as possible to a black radiator, which gives you the maximum amount of radiation. This is something unique in our oven heating system. Our heat exchanger is a block design with just the connection of the oil pipes and the burner sitting on the top. We developed a special thermal oil pump to create a closed system, since no sealing means no risk of oil leaks.

Bake Process

Much more important to a baker is the bake process. The bake process in thermal oil heated ovens is really different to cyclotherm ovens. (NB In cyclotherm ovens the products of combustion, a mixture of air and burner gases, are circulated around the oven through ducts and radiators to give radiation heating from top and bottom of the oven decks). If you really use these differences you will get a better product with regard to quality and some other issues. The difference comes mainly from the temperature level we have in that oven. If you look at a standard cyclotherm system that systems starts at the entry of the oven with a certain temperature and due to, what we call heat capacity, the temperature inside your cyclotherm system drops considerably. The “gas” in the cyclotherm system cannot carry that amount of heat while the liquid “thermal oil” can. If you look on a thermal oil heating system you start with a lower temperature. You can keep that temperature during oven loading, with a drop of approximately 3 to 6 degrees C, while you have in the cyclotherm system a temperature drop of 50 to 80 degrees C. In order to transfer the required energy you have to start with a higher temperature in the cyclotherm system. Higher temperature has of course an influence on your product. Dividing the bake process into different parts will show us the differences between the two above mentioned systems. The cyclotherm system starts with a higher temperature in the oven, creating, we believe, not actually a real crust but a dry part of your product starting from the surface. This will be less on a product being baked in a thermal oil oven. If we go further into the bake process, with a thermal oil oven we stabilise the product and we create volume. The time to create product volume before it is set is almost double the time in a thermal oil oven compared to a cyclotherm oven. For standard bread you have a volume development time of 8 to 9 minutes and in a cyclotherm oven it is actually *4 to 5 minutes because you show more temperature to the product. Therefore, for bread, you need a higher final proof when baking in a cyclotherm oven, whereas, because we create volume (larger oven spring) in a thermal oil oven, a lower proof is required. A built up of dry crust in the cyclotherm oven blocks the heat transfer to the core of the product, again a difference to the bake in a thermal oil heated oven. More water in the product near to the surface of the product improves the heat transfer. That’s very simple, it’s physics. And if we finally go to the end of the bake process, we create in a thermal oil oven, with a temperature increase, crust and colour. We achieve the final core temperature a little bit earlier in comparison to a cyclotherm oven, which can dry out

the product. Our intention should be to keep as much as possible water in the product because this improves quality and of course shelf life of the products.

To summarise the benefits of baking in thermal oil heated oven:

- mild and less aggressive heat gives less surface temperature
- a thin crust with more water gives you a better temperature flow to the core of the product
- staying longer with a flexible crust creates more volume
- keeping more water in the product creates longer freshness
- longer freshness means more flexibility in your production
- a better temperature control inside the thermal oil gives a better control of the bake process

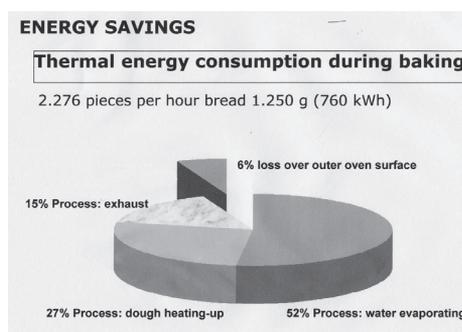
As a result from the above the dough preparation for baking in thermal oil heated ovens is different. We know from our installations that for breads the water to flour ratio in the dough can be increased from 60% up to around 70%. This means in the end that you use less flour for the same bread weight and you get a higher quality and a longer shelf life. This is what our customers keep telling us.

Note from the BSB The comparisons Gerd makes between thermal oil and cyclotherm heating systems, and on the quality of bread baked using these systems, are based on his knowledge, experience and personal opinion. The BSB wishes to point out that it does not favour any particular oven heating system and would advise anyone considering an oven replacement to carefully consider the pros and cons of all oven heating systems with regard to their own particular requirements before making a final decision.

Saving Energy

Beside the bake process, today everybody is interested in saving energy, so saving energy with the bake process means a lot to our customers because the bake process is consuming the highest amount of energy in your bakery. In a standard thermal oil deck oven baking batches of products, we can build a number of decks in one oven and we can close those decks with doors in the front and back end. With that we have full control on what’s going on in the steam zone. Additionally we have curtains inside every deck or bake chamber. We have full control on the exhaust and fresh air intake because we have a closed system inside the bake chamber, which gives us much better control of the bake process and bake temperatures and climate. By controlling this we can determine the amount of humidity we need to have in the bake chamber. Too much steam inside the oven costs you a huge amount of money and very often the product doesn’t need it!

The following chart should give you more information about energy consumption in the bake process. This is just one example for an oven baking 2,276 by 1.25kg loaves per hour.



You see approx. 50 % of the energy is needed to evaporate water from the products, the so called bake loss. A bake loss for bread in a standard cyclotherm oven is roughly 15 %, while we can achieve in a thermal oil heated oven a figure of just 12 % bake loss. This 3 % less means a reduction of 20 % of the bake loss in a tunnel oven and results in a 10 % decrease in energy consumption for thermal oil heated ovens. This is just by using thermal oil heating and nothing else and is something you can create in thermal oil heated ovens from all manufacturers, not just Daub ovens, if you do it right.

The next chart shows you energy savings under consideration of our “Daub Standard” multi-deck oven. We just take 70 % of the possible energy savings because we know from experience that 30 % will be lost by something that cannot be controlled i.e. your process, your employees, etc.

Energy Savings with Thermal Oil Technology*

Less bake losses up to 3 %

⇒ Savings in flour and energy

Savings up to 30 %

⇒ ROI faster

Examples of Savings

(Considering only 70 %):

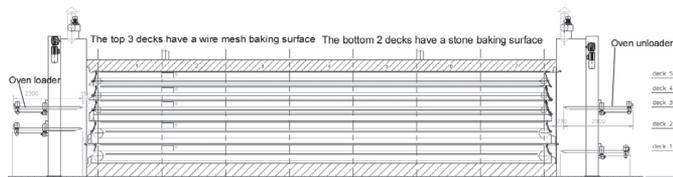
60 m² Oven, one shift operation 11.000 € per year

136 m² Oven, three shift operation 144.400 € per year

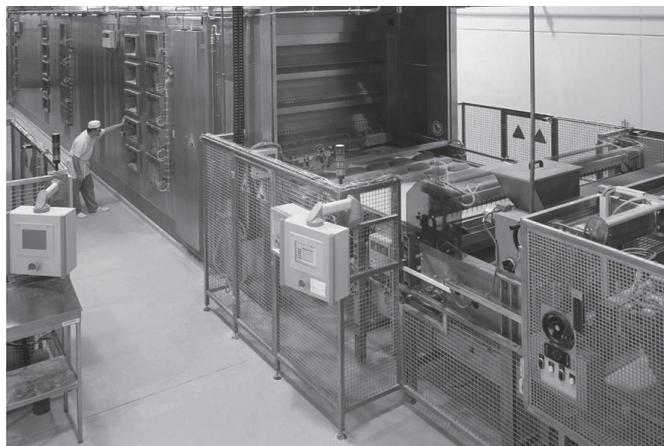
* Comparison between a large thermal oil heated deck oven compared to a cyclotherm tunnel oven

If you have a small oven in one shift operation it's not that much, just Euro11,000 per year, but if you have a larger oven, three shift operation, you can save more than Euro140,000 per year, depending of course on the cost for energy.

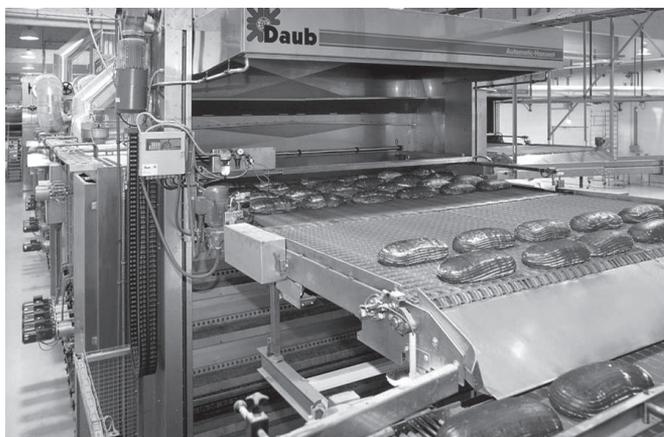
So we talked about the process, we talked about energy savings, what I would like to do now at the end of my presentation about ovens is to give you an idea how we design automatic thermal oil heated multi-deck ovens with conveyor loading and unloading. You can build one deck on top of the other, up to seven decks and run different lines in the same oven.



The diagram and photographs show the layout and loading and unloading sections of a 5 deck thermal oil oven with three decks wire mesh conveyor and two decks stone conveyor. You feed in the products to be baked with a loading conveyor and after baking you take them out with an unloading conveyor and they pass on to cooling, packaging, further processing etc. So you can feed this oven with, for example, an artisan bread line baking on stone and with a roll line baking on wire mesh, all on the same bakery area footprint. The photographs give you an idea of how such an oven looks and below are some of the products baked in it.



Loading end of a multi deck thermal oil oven



Unloading end of a multi deck thermal oil oven

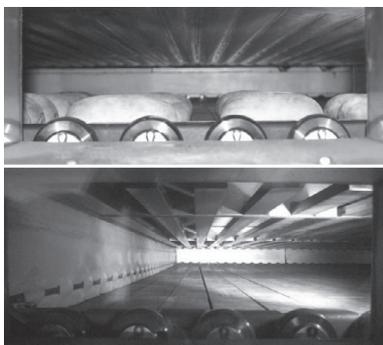


A selection of German rye bread Kaiser and brown crusty rolls

Baking on Stone

Baking on stone really does make a difference to the quality of the bake. We have seen in the last 2 to 3 years a lot of interest for baking on stone, even in automatic ovens. As you will know, the bake process in standard deck ovens with a stone (tiled) sole, is that you feed the products in from the front and you have to take them out from the front after baking. In automatic ovens you can have a conveyor system equipped with stone (tiles), feeding the batch to be baked in from one end and then out the other end after baking. What we have done in the last two years is to change from granite, which was the standard stone in such ovens, and we replaced it with a stone called “New Serptino”, because it had better baking attributes in terms of heat transfer and radiation. Last but not least New Serptino has a longer lifetime because it is not as brittle as granite. From the first installation we saw a big influence on the bake result. We get a very good bottom bake on the products and very good side stability, even if we put the products very near to each other during baking. This is really a different bake. So what we achieve with this stone? We can use a soft dough with a high water content and we can create a big product volume, stable crust and an open structure, and most of all we create good overall product bake quality on stone.

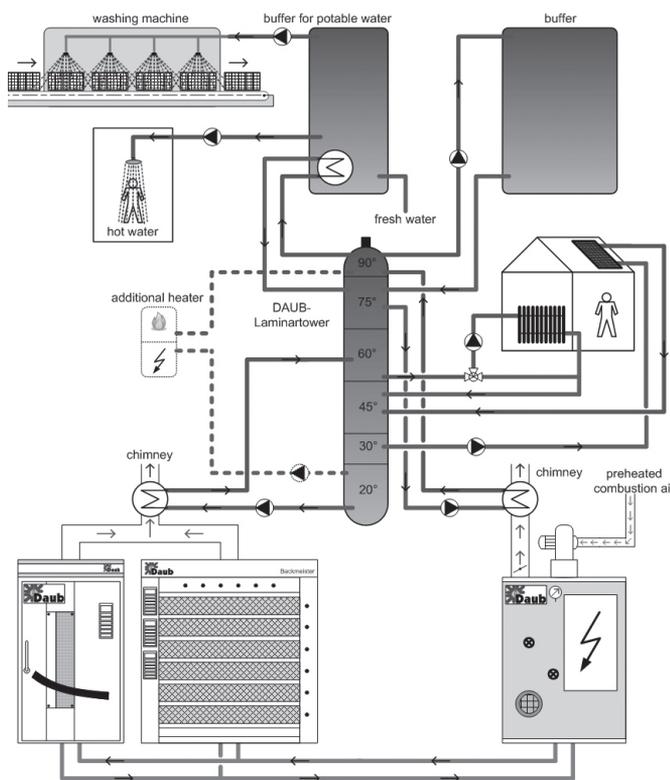
The photograph just gives you an impression of the system with a stone belt. It took us quite a time to develop that oven, because we have a huge weight sitting on the oven floor area. We even developed a rack oven heated by thermal oil and on which the trays bake on stone.



Two pictures of the inside of the stone soled conveyer oven, showing it empty and with bread

Heat and Energy Recovery

Finally I would like to give you just an idea about what you can do if you run a bakery and you need to save energy. If you have an oven and that oven needs 100% energy, you will carry out through the flues roughly 50 % of that energy with the hot products leaving the oven. This energy is lost to your bakery room. Roughly 50% you will put into steam and exhaust. Only this last 50 % can be reused. We build a system where we can reuse, get back roughly 45% of the total 100% of waste heat. Our system incorporates also all other heat sources by using a very simple unit, the so called "Laminar Tower". That's a system where you have inside different temperatures; we call it a simple pipe system. You can take off at certain heights particular temperatures of recovered heat. It's a very simple and I have to confess, also a very cheap system.



What can you do with the recovered heat from the system in your bakery? The diagram shows the main operation of the system with the Laminar Tower. For example, you can use the higher temperature recovered heat to heat up water and the lower temperature recovered heat to heat up a room. And all the recovered heat comes from your heat exchanger and from your oven. This is a simple system.

Summary

So what we have seen is a different bake process in thermal oil. This is really something you should carefully look into because different bake process may mean that if you use it in your bakery you may have to re-think part of your production process. You have to go through your dough make up since you may have to add more water. Sometimes that's difficult because your dough divider cannot handle the softer dough. But it's a chance to build a different product with a better quality and also save energy. The thermal oil heating system also makes energy recovery much easier. A pay back time for the energy recovery system is around two years.

Thank you for listening.

Sessional Chairman Keith Houliston

Because Gerd has overrun there will not be time for questions. However Gerd will be pleased to answer any questions you may have during the coffee and lunch breaks

I am now delighted to introduce Dr Ken Johnston of the Faraday Partnership to present the next paper on the effects of reducing the salt level in bread. Ken was responsible for designing and implementing a major FSA funded research project to investigate the role of salt in bread dough and in the final bread. The purpose of the project was to give us a better understanding of how salt level influences both the handling of bread dough during processing and the final bread quality. The FSA's desire for the industry to substantially reduce salt level in bread to help their objective to ultimately reduce the UK population's average salt intake to 6g/day, has been the subject of much recent discussion. We very much look forward therefore to Ken's presentation. Please welcome Dr Ken Johnston.

The Role of Salt in Bread Dough and in Breadmaking

Dr Ken Johnston



Thank you Mr Chairman. The project that I want to talk about addresses the Food Standard Agency's intention and desire to reduce the salt content in our diet. With this aim in mind they have published targets for 2010 and 2012. The table below shows the targets for 2010 and 2102 for bread and morning goods. These are very much milestones on the journey rather than the destinations, and that's the message I'm bringing and one I am sure Stephen Humphreys will reinforce this afternoon.

The project which I facilitated and led, came from a discussion between the Food Standards Agency and the Federation of Bakers (the large plant-scale bakers), who cited problems in reducing salt in premium breads particularly due to the quality attributes that they wanted to offer in those breads and also delivering those particular attributes on high throughput bread plants. So we worked together to try and think out "Is there an underlying mechanism here which can explain many of the issues and many of the concerns of the bakers, and if we understood that underlying mechanism then we would have

Recently published targets for salt*

2. Bread	2010	2012
2.1 Bread and rolls Includes all bread and rolls: pre-packed, part-baked and freshly baked (including retailer in-store bakery) white, brown, malted grain and wholemeal bread or rolls including seeded products, French bread, ciabatta, focaccia, pitta, naan, chappattis, tortillas etc without additions (e.g. cheese, olives, sundried tomatoes etc, see category 2.2)	1.1g salt or 430mg sodium (average)	1.0g salt or 400mg sodium (average)
2.2 Bread and rolls with additions Includes all bread and rolls (as listed at category 2.1 above) with "high salt" additions e.g. cheese, olives, sundried tomatoes etc. Also includes cheese scones	1.3g salt or 500mg sodium (average)	1.2g salt or 480mg sodium (average)
2.3 Morning goods Includes plain and fruit scones, crumpets, pikelets, English muffins, Scotch pancakes, bagels, croissants, brioche, soda farls and waffles etc. Also includes all buns, e.g. hot cross, teacakes etc, except iced finger buns (see category 12.1 Cakes). Excludes cheese scones (see category 2.2).	1.3g salt or 500mg sodium (average)	0.75g salt or 300mg sodium (average) 1.0g salt or 400mg sodium (maximum)

* The full list for bakery products and all other foods can be found by following the links on the FSA website: www.food.gov.uk/healthiereating/salt/saltreduction

some new approaches perhaps conceptually for solving the problem?" So it wasn't about finding a silver bullet, it was about understanding how salt has its effect on the breadmaking process and how those effects are seen at different stages of the process.

The main issue that the bakers raised was that of a sticky dough. A dough that's difficult to handle from the moulder into the tin, because at this stage they are talking exclusively I would say, about tin bread, about pan bread. And that's the first point of failure, if you can't get it into the tin, you're finished, so that's perhaps the critical point in the process that we have to think about.

There was also concern about loss of tolerance to over-proofing; if there's an interruption on the plant the dough gases too quickly. If it's a bit hot, a nice hot day like this, the bakery temperature goes up, again you've lost tolerance and this term tolerance is one that kept coming through from the manufacturing bakers. And the risk at the end of the day is that the texture of the bread is more open than desired for this particular type of product.

The bakers also raised the topic of flavour and talking at dinner last night everyone says "Yes, what about flavour?" Now that was not part of the project because the view from the Food Standards Agency is that if salt levels are changed gradually, then the consumers will adapt to any change in taste. So this wasn't on the agenda for discussion. I know it raises lots of different points of view but it wasn't within the project.

So who did the project? The project was carried out in the test bakery at Campden BRI by the team there who are very experienced at test baking and we did a whole range of, call them lab analyses for lack of a different word, research type

investigations in the food science department at Nottingham University. The Food Processing Faraday, my organisation, is one which doesn't have any physical facilities. We facilitate things and try and help people contact providers of information, providers of knowledge.

There is a report, about 180 pages. We are working through the final comments from the peer reviewers and I have undertaken to get that to the FSA for the end of the month, so hopefully it will be out soon, it will certainly be in the public domain when the FSA have got it because that is the way they work. (Follow-up note: The report has been published on line http://www.foodbase.org.uk/results.php?f_report_id=364)

So this presentation is picking out the highlights from the main points of that report.

Why do we have to do the work? Well we believe that while there is some published research on salt in baking, it is actually not good enough to solve the problem. Why? If it was good enough to solve the problem, the problem wouldn't be there! So it's very simple, we need to develop further knowledge because what is out there is not delivering well enough, and is not perhaps sufficiently relevant to the type of products that this group of people were interested in.

The project has scientific hypotheses behind it and I will try and explain the hypotheses, try and get some buy into the hypotheses. Because salt is soluble, we know it's soluble, you can dissolve salt very readily, it has access to all components of the dough. We are talking about starch, about gluten, about water soluble ingredients, about fibre and about yeast. Salt has access to all of these and so as a unifying concept it was proposed that the distribution of salt and the way that it interacts with these components could have something to do with the effect on handling dough and making bread from that dough. So it was about the question "How does salt affect the fluid phase?" There are various ways of measuring that, and how the changes in the fluid phase affect the physical manifestations that we see in the bakery when we are making bread.

So was the hypotheses valid? Well regrettably the answer has got to be "No". We did not find that salt affected the fluid phase in dough. So if you are desperate for your coffee and that's all you wanted to hear can you be very quiet at the back of the hall please while I go through some of the reasons why this conclusion is offered.

So what have we learned? Before I go into the detail of this I need to just mention yeast, because yeast is a complicating factor. It's well known that the rate of gassing in a dough increases as the level of salt is decreased, so in other words if you drop your salt level by 0.2 say and hold the yeast steady, the dough will prove up more quickly. Now that means that something has changed. The rate of proof, the time to develop volume has changed, and for the purposes of this project we adjusted the yeast level so that the proof time was held constant. You've got to do something about this, you can't just ignore it. That's one approach. You could have changed the proof time. But what this means is that in all cases there is a relationship between salt level and yeast level. The sceptics amongst you could say hang on, all you have done is prove that the effective change in yeast level affects bread and I can't argue against that,

statistically, scientifically. I don't believe it's the case but the results plot out in the same sort of way.

Unfortunately in the work that Nottingham University did where they were handling samples in NMR devices, doing calorimetry on it, doing various rheological tests, if they had yeast in the dough the dough would be gassing and changing in volume and it would be impossible to get any sensible results out of it. So we are in a sense comparing apples and pears here. Baking was done with yeast and laboratory analysis was done without yeast, something which must be borne in mind when reviewing the results

So what did we find out? In terms of dough handling the message is this, that as you go to lower salt doughs, if the dough temperature goes up it becomes more difficult to handle and that addresses this issue of environmental sensitivity, hotter day in the bakery today the lower salt dough is going to be more difficult to handle. If you hold up the dough for a bit longer in the divider, due perhaps to some sort of downstream breakdown, again it would be more difficult to handle that dough if it is low salt. So this is the test bakery evidence of lack of tolerance.

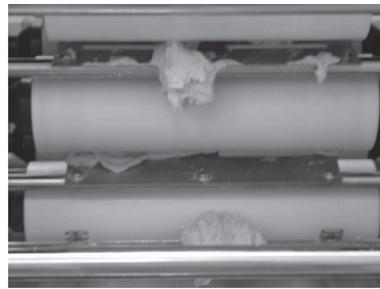
	2.0% salt	1.4% salt	0.8% salt
29°C dough		More difficulty in handling	
33°C dough			

	2.0% salt	1.4% salt	0.8% salt
15 minutes dough to moulder		More difficulty in handling	
30 minutes dough to moulder			

Dough handling: Top diagram - lowering salt level and increasing dough temperature makes the bread dough more difficult to handle. Bottom diagram - lowering salt level and increasing dough rest time prior to moulding makes the bread dough more difficult to handle.

How did we measure this? On the moulder. We counted how many dough pieces went through the moulder under processing conditions which were deliberately pushed to the extreme. In the test bakery environment, we cannot process hundreds or thousands of pieces of dough to wait for the odd one to stick up. We've got to push the system to limits at which you start finding maybe half of the dough pieces, or a third of the dough pieces sticking in the moulder. So that was our real live test of bad dough handling and it's pretty horrible and pretty ugly. And of course if that happens in a manufacturing plant where automated running is going on, the next piece of dough is almost certainly going to jam up on the first and then you've stopped production. We couldn't do that in the test bakery so we have to take the dough out of the moulder, clean it up sufficiently to allow the baking to continue.

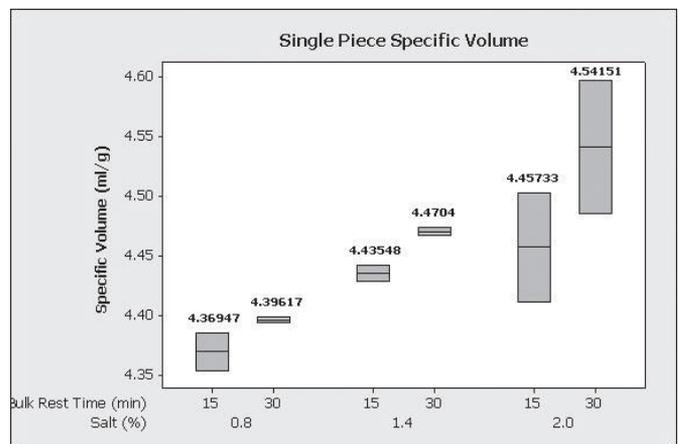
This issue about dough collapse at the final proof stage - we measured the susceptibility of the dough to collapse by dropping some tin with the fully proofed dough piece in them and comparing them with bread from tins which had not been dropped. However from these tests, on the basis of statistical analysis, we couldn't see any effect of salt on dough stability for dough pieces which were proved to the normal fixed height.



Bread moulder showing dough sticking to the sheeting rollers

Sometimes, not always but most of the time, we found that bread volume tended to increase with salt content. So in this graph you've got the trend from bottom left to top right so volume is increasing with salt content but within that of course you notice we had on this experiment

looked at different rest times. Shorter rest time gives lower volume than longer rest time which is not particularly surprising, because at the shorter rest time there is a bit less gas in the dough when it got to the oven than after the longer rest time.



Loaf volume from test which included three levels of salt plus 15 minutes and 30 minutes dough rest periods prior to final moulding

Bread texture is quite an interesting topic, quite a hotly debated topic, almost a contentious topic I would say. We did not have dough which accurately mimicked commercial dough, because commercial dough is designed to be very robust, able to be handled at high speed and high throughput on line, so it is designed not to fail. In order to get failure within a smaller number of dough pieces we had to ease back on the strength of the improver. We had to push the temperatures higher than normal, we had to increase the rest time beyond typical rest times. So actually none of the bread that we made was that brilliant. It was acceptable and when we looked at the trends in texture we didn't really find any. There were differing views. We had the bread independently scored by Campden BRI, by their baking experts and we had this wonderful group of people, including our Sessional Chairman today Sara, pouring over the bread and I would say that, I don't know if you guys examine bread, but is this the standard bread evaluation position? You know, hmmm what's this like?

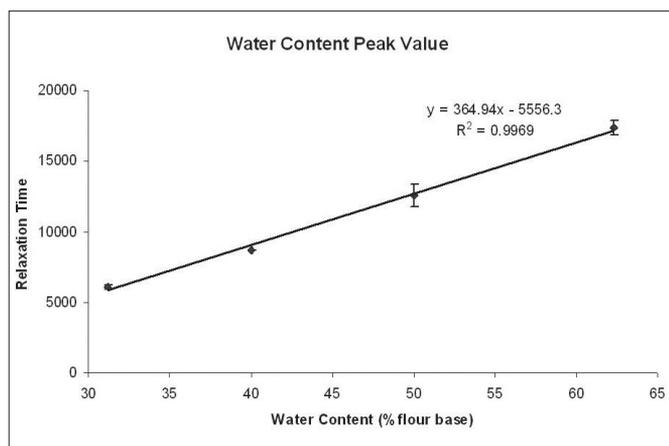


Members of the project team and Campden BRI bread experts examining the bread from the reduced salt trials

So I think the long and the short of it is that there were no really strong trends in the structure of the bread that we can exploit and explain but what we really did see were differences in the handling characteristics of the doughs.

So the other part of the project was about the fluid level of the dough. This assumes that there is some sort of fluid phase that bathes the ingredients within the dough piece. As far as I know, for the first time, we used three completely independent ways of probing the fluid phase, and now I'm afraid we have to go into a bit of science because we used three methods. We used NMR, Nuclear Magnetic Resonance, we used DSC, Differential Scanning Calorimetry and we used Ultracentrifugation. I'll go through these one at a time and explain the main findings with each technique.

So what is NMR – Nuclear Magnetic Resonance? It's the technique from which MRI imaging was born, medical imaging came from NMR so what this really does is measure the rates at which hydrogen atoms can return to a low energy state after application of a pulse of radio frequency energy. So you disturb hydrogen atoms (and hydrogen atoms are abundantly present in water, starch, protein, fat, and in fibre), with a pulse of radio frequency energy and then you watch how quickly they return back to their previous calm state. If they return very quickly then that means they are in an environment which is like a solid. If they return very slowly then it means they are in an environment like a liquid. If you go for an MRI scan, actually what you are seeing are your tissues, or parts of your tissues which are more solid and parts your tissues which are less solid. So we use this tool on a piece of dough. It observes anything which has got hydrogen atoms in it so not just water, but also if there is any sugar in there because there is hydrogen in sugar and so on; and all of those will contribute to the signal.



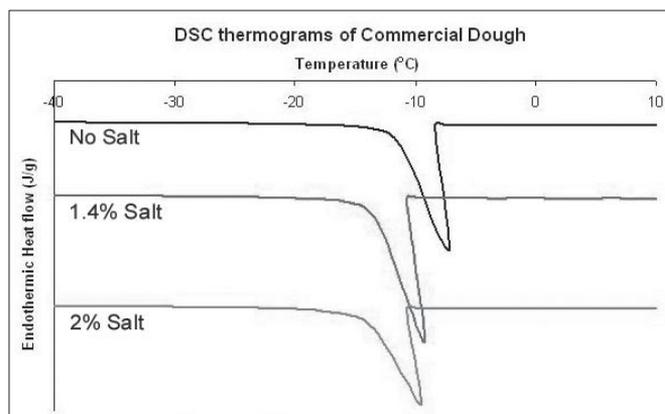
NMR signal increases as the amount of free water in the dough increases and vice versa

So what does NMR tell us? Well this graph very simply says as I increase the water content of my dough the signal I get from my NMR instrument goes up. We put in more water we can see more water. And you can work out from the quality of this fit what the smallest change in water content is that you can perceive. And the answer is about 2%. 2% change in water content we can pick up by NMR. Now 2% change in water content would I think make a perceptible difference to the way in which a dough handles.

We took the data from a number of different NMR experiments

and analysed it very carefully but found that there is nothing happening. Although the salt level went from 0% added salt up to 5% added salt, much more than you would ever use in any sort of UK bread product, our NMR data, which we analysed in 5 different ways, does not show any difference in the fluidity of the hydrogen atoms due to salt addition. We cannot see any difference in the way the hydrogen atoms are behaving. If for example salt was liberating water I would see an increase in the signal. But it's not. If salt was binding water, we should see a drop in the signal. But we actually see no change in the signal. So that's the conclusion from the NMR work. We can pick up a change in water content of 2% but despite a great deal careful experimentation we can add 5% salt and see no change to the water movement in the dough.

DSC technique No 2. Differential Scanning Calorimetry. What happens is you take a very small sample of dough, milligrams, a tiny amount, and you place it in a sealed container and you heat it or cool it at a fixed rate of so many degrees per minute. You measure the energy required to change the state of that dough. So when it freezes for example and ice is formed we can measure the amount of energy required to make ice. Having frozen it, if you melt it, it can measure the amount of energy required to melt the ice. If you heat it up and its starch gelatinises, we can measure the amount of energy to gelatinise the starch. If you know the number of Joules of energy for a gram of ice formation you can work out how much ice is formed, or how much ice was melting.



DSM Results: Ice forms at a lower temperature as the amount of salt increases but the amount of ice formed does not depend on the salt level

So this technique looks at the physical properties of water in the system. Does it freeze, does it not freeze and here is one of our graphs about ice formation. We've got three lines there, the top line has no salt added to it, the middle line is 1.4% salt on flour and the lower line is 2% salt on flour. You will see the peaks move to the left with salt addition so the water in the system freezes at a lower temperature as you add more salt. But that's nothing special. That's A level physics, if you had the fortune or misfortune to study that. That's well known. If you look at the amount of ice which is formed in these systems it does not change, you are forming the same amount of ice irrespective of the salt level added to the dough. So again from the DSC we are seeing that the amount of water which can form ice does not depend on the level of added salt. So again we would conclude using this measure that salt is not affecting the amount of fluid phase, the amount of phase behaving as water (or ice) in the system.

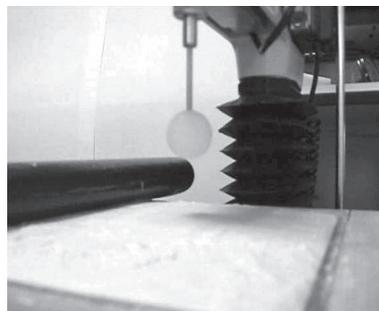
So to the third technique and this is Ultracentrifugation. What happens in this technique is that a piece of dough is put into a centrifuge and it's spun at very high speed, 126,000 times gravity, for an hour. So quite a severe treatment to the dough and when you do that the dough sort of breaks down and you get a liquid layer called typically 'the dough liquor' on the top of the tube and what's left underneath that is the solid which is the starch, the protein and any other solid material in the dough. You can measure the amount of dough liquor, just tip it out and measure it, and you can analyse it's composition in all sorts of ways. And we knew from some previous work that there have been effects seen of salt level on dough liquor and so we repeated and extended it. We found indeed that as you increase the salt content the amount of dough liquor coming from the sample increased. So more salt led to more material which can be centrifuged out as dough liquor. Now the other thing, and I don't have the information here today, is that this technique is highly sensitive to actually what you've got in the system. If you change the improver the amount of dough liquor changes quite dramatically, so there's something going on here that we need to understand.

If we take all of these findings, the Ultracentrifugation where salt is affecting the amount of dough liquor and the other two techniques where salt is not affecting the fluidity, we think that you can then start to synthesise a picture from the three pieces of information and I don't think this has been done before so this, I think, is new. When we are ultra centrifuging we are getting out a fluid phase, that's beyond argument. You can see it, you can touch it. It requires a long high speed centrifugation so it's a significant imposition on the sample and what we think is that under the conditions of high speed centrifugation the amount of dough liquor released depends on the porosity of the sample, on the solid part of the sample perhaps rather than on the liquid phase within it. It could depend on the surface tension of the dough liquor, that comes from some basic equations but we are not sure, we haven't got the information on that and it certainly gets very complicated as you start to look at improvers which undoubtedly do affect the surface tension of that phase.

So the model that we've got is that salt affects the solid phase rather than the fluid phase and it's a bit unfortunate in a sense that we put a lot of effort into determining the fluid phase and we find that it's not primarily affected by salt, but it was a very plausible idea that could bear on all the effects that are seen in terms of the bread making.

We did some dough rheology tests using three methods – Chen Hosenev Stickiness Cell, Kieffer Extensibility Rig and Nottingham Indentation – Withdrawal test - the first two are standard methods, the third one is slightly different and I'll talk a little bit about it. There are small differences in rheology you can see. It is difficult to quantify these statistically significantly when yeast is present in the sample and I think that is because to do a measurement of dough rheology you need to know exactly the density of the sample, you need to know there are no bubbles of gas in the bit that you are working with to disturb your measurement. With yeast present, this requirement is difficult to meet.

The Nottingham Indentation – Withdrawal test is shown in the photograph and which I will talk a little bit about. It's very simple – a piece of dough was rolled out into a tray, it was then

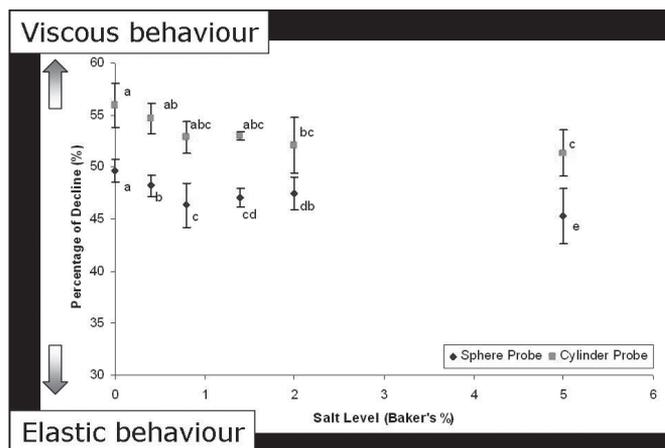


Spherical probe driven into fresh dough then retracted to give an indication of the 'stickiness' of the dough

turned upside down so that the lower surface of the dough which hadn't had the opportunity to dry out was exposed. A probe, in this case a spherical probe, was brought down, pushed into the dough (you can measure the force it takes to push it in), held in the dough for a short period of time (so we could measure how the dough

is pushing back on the probe), and then pulled out of the dough (so we can try and get a measure of stickiness). So the idea was to get a feel for the stiffness, elasticity and the stickiness of the dough in one test. Regrettably it didn't give us significant results on stickiness but we did get results on stiffness and elasticity.

The balance between elastic behaviour and viscous behaviour changes with salt level. Now you've got a sample like dough and we know it has a certain elasticity, if you pull it it's got some elasticity to it, but we also know it can flow, you put it down and it will gradually flow. The balance between these two can be described, and what diagram below shows is that as the level of salt in the dough is increased it becomes slightly more elastic and therefore slightly less viscous. And that may have some effect on the issue of stickiness. At lower salt levels it's behaving more like a viscous liquid, at higher salt level it's behaving a little bit more like an elastic solid.



Salt and doughy rheology - as salt level is increased, bread dough becomes slightly stiffer to an indenting probe

So what are the take home messages? The first thing was we found general trends, not sudden changes, and I think for the project this was actually quite an important find. We had these big debates between the Nottingham research scientists and the practical bakers, and the research scientists were saying 'Is there a cliff and beyond which you fall off and you simply cannot make bread?'. The answer to that is "No", properties change gradually, it's not a dramatic drop but of course on any one person's piece of equipment the parameters at which you suddenly get failure are going to be in different places, so in your plant you may have this level of tolerance, and in his plant he's got that level of tolerance, and that has got to do with the process and the ingredients that you are using. So there is a cliff

individually but across the patch we don't think there is a cliff. We know that as you reduce the salt level the dough becomes more sticky under abuse conditions. We couldn't measure stickiness of the dough very well and that was an issue. We certainly cannot come up with any explanations for stickiness based on the fluid phase, based on the dough liquor, or based on the water in the system because actually as the level of salt is decreased, the fluid phase does not increase. The loss of elasticity may affect handling properties, but it's not a concrete case, it's not a cast iron case at the moment.

Salt and low volume. The starch gelatinisation temperature increases as salt content increases (data not shown here). Gerd Meyer was telling us how bread expands until the crust sets which is absolutely right; bread expands until the starch gelatinises and so the higher that temperature is, the more time you've got for expansion. So there is potentially a mechanism here for why adding salt, which increases gelatinisation temperature, also increases loaf volume. Bear in mind of course that the yeast level is not the same and so it could be a yeast effect.

So what are the messages to this group? The most sensitive issue is going to be failure at the moulder, that's where you are going to run into trouble first. And as salt level is reduced you are going to have to be more careful, or take some other steps to have greater tolerance at that stage. Because real bakers use different equipment, and are making products of different quality, you cannot define a particular salt level below which it becomes much more difficult to bake bread. Not in general but almost certainly in particular on your plant, that level could be quite quickly identified. There might be a summer level and a winter level of course, because of temperature effects.

It's difficult to measure changes in dough properties which adequately explain the test bakery observations. We've made some attempts at it and made some progress, but it's not a cut and dried case. We believe that dough is more elastic at higher salt levels. We believe that dough releases more liquor in ultracentrifugation as the salt level is increased, but the latter is not the result of there being more fluid phase, it's something to do with the properties of the solid. And if we want to have any discussions on dough, at any stage at all in terms of "water binding", or the "fluid phase", this is fraught with difficulties because we know that you need to use the right sort of methods and we need to use independent methods to establish whether they are true. It's perfectly fair to say 'I observe that this dough does this' but to say that it's due to water binding actually you need to have some sort of confirmatory testing, perhaps by more than one method before you've actually demonstrated that that is the case. It is prudent to reduce dough yeast addition when salt level is reduced so as to maintain gas production rate and proof time. If not the proof time becomes shorter and it becomes even more critical to get the timing right and even more critical to control your dough and ambient temperature.

I would just like to thank the Food Standards Agency for the support they gave to the work. There was also terrific support from members of the Federation of Bakers and from all the people involved with the project. Thank you.

Question: Jim Brown, Cumbernauld
The message I got from your presentation is that if you have a

very modern plant bakery with good control on dough temperature and a stable ambient temperature, then you shouldn't have too much trouble decreasing salt. I think at the moment dough temperature is probably 30- 31°C. Is the recommendation that you need to go down to 29° C and maintain it through the whole process?

Answer: If you could, yes. But in my experience, and my background has been more with big scale plant bakeries, the plant bakery is specified up to do something and there is always a condition where life becomes more difficult and it ceases to hold it's specification so the dough temperature goes up, the lag time between one part or the other increases because something has broken down or stopped. So in theory yes, if you could hold your dough temperature at 29 degrees you certainly would have less trouble than if it went up to 31. But I know from talking to bakers that there are times when they just cannot do that, there's a limit to what you can do with flour chilling, water chilling, ice addition and so on. We've got to work in the real world.

Question: Andy Pollard, East Yorkshire
I know it's not in your remit to talk about flavour, but you are talking about the reduction of salt and therefore the reduction of yeast, but reducing yeast and salt is just going to make the product so bland that it's going to become non-acceptable.

Answer: That's a concern that I have heard expressed and all I can say is that I understand that concern. I can see that there's a change in flavour. There may be ways of altering that but they are not really through the use of salt substitutes because they bring problems in themselves and they don't work on the dough in the same way that salt does. But I can genuinely understand the nervousness of any producing baker in undertaking this. That position has been put to the Food Standards Agency on many occasions I think and all I can say is that their view is with a gradual reduction people's taste will adapt and will cite past experience to back that up.

Question: Gerd Meyer, Hamburg
You mentioned a difference in structure with more salt you see, or you expect more structure in the solid phase. Did you see any influence on the baked product, especially if I think about par baked products and we always struggle with a par baked product, side stability, can we expect any influence on the structure in the baked product?

Answer: We only baked bread in tins, in pans, in this experimental work so I can't comment on oven bottom and roll type applications. We are doing some work with the craft bakery sector now which is looking at oven bottom bread but is not bringing in all the scientific collaboration that this project had. As to whether it would have an effect on structure I really don't know because we were looking to see the process failure and we found the process failure to be happening at the moulding and handling phase. But in order to find that failure we were working with the dough which was giving "indifferent quality" bread, using the Chorleywood Bread Process bread so it was a one dimensional look at things so I can't really give you an answer to your question, I'm sorry.

Question: Sara Autton, Chorleywood
You mentioned the effect on starch gelatinisation of reduced

salt. Is there going to be any work done on the effect reducing salt may have on the staling rate of bread?

Answer: That was not done in the project. It was discussed up front but it was felt that to do a full study of that required a project that was virtually as large as the project that we did and the funding wasn't available to do it. I think perhaps the message has got to be that given the continuing pressure from the public health authorities to reduce salt in the diet, and pressure on bakers therefore to meet that very particular analytical and nutritional targets, there is opportunity to do more work on these things and I for one would be very happy to work with people who are interested in that to try and find some funding and means of doing it. It is an interesting issue. If you look at the published work it suggests that lower salt bread stales more quickly, it suggests that some of the Italian bread where there is virtually no salt in, they've developed a tradition of stale bread dishes. I don't know what the relationship is between salt levels and staling, I haven't seen any papers on that, they may be there but I haven't seen them, so it's an important topic.

Sessional Chairman Keith Houliston

Thank you Ken Your paper created a lot of questions and interest, which we very much appreciate.

Our next speaker is Chris Beaney, the Immediate Past President of the National Association of Master Bakers. Chris has recently completed his term as NA President during which he worked extremely hard and has done the office proud. Chris owns a craft business in Strood in Kent which runs a bakery and three retail shops in which his family are involved. Chris's presentation is on the first ever National Craft Bakers Week which took place between 8 – 13 June. The campaign was spearheaded by the National Association of Master Bakers and has been developed with a group of key industry players. The aim is to raise the profile of independent craft bakers and in doing so gain more sales and customers. The initiative has created a lot of interest, national radio and no doubt some of you heard Terry Wogan on Radio 2 talking about London baker Christopher Freeman's big batons and various things that he sent to him. The campaign also received excellent ITV coverage on Yorkshire television. Chris will talk about the theme 'the shop that never sleeps' highlighting the craft production process and all the work that goes into making the products that appear on baker's shelves. Multi media information was also sent to 19,000 primary schools to create interest with school children. Without further ado can I please hand you over to Chris Beaney.

National Craft Bakers Week



Chris Beaney

Thank you Mr Chairman for that kind introduction. After all the very learned speakers you have had this morning I am here as Chris Beaney, Craft Baker, son of a baker, my father was a baker and my youngest son is also a baker. I've been asked to talk to you today about the National Craft Bakers Week that we held

last week all over the country. It was an absolutely fabulous week that was a great success everywhere. It started 6-8 months ago so what I'm going to try and go over with you is the concept behind the actual promotion, the ideas, the decisions that we took, the actions that happened and afterwards how it went at the end and how we felt that it worked.

The initial idea came from Gill Brooks-Lonican, who is the Chief Executive of the National Association of Master Bakers. Gill felt that with the credit crunch as it was a lot of bakers were finding it difficult, as were everybody in the retail manufacturing trades, and it would be nice to get people together from the baking industry and see whether or not we could come up with a promotion plan. So under those circumstances the first thing you do is form a committee. The committee was formed by writing to the heads of the bakery supply industry to see whether or not they would be pleased to come and join the discussion about putting a promotion on. Almost without exception they all replied back in the positive which was really good. The committee then had representatives, including the NA of course because we needed craft bakers to discuss what the problems were going to be and how we would get through our promotion. Sonia Young was the representative from the editorial staff of British Baker and she proved to be invaluable later on when we made the decisions we took. The PR staff we took on board were from a firm called The Garden, who promote California Raisins, who were also part of the committee. A little later the Scottish Association of Master Bakers came on board and I think they were really quite pleased that they did. So that was the actual partnership, how it started off and the sponsors are shown in the following diagram.



The committee were left completely free to work out what ideas they wanted and how the promotion should proceed. Was it to be a one hit wonder where we all filled our shops up with posters and let it run on and see what would happen, or would it be an ongoing promotion where it might happen over a number of weeks or months or whatever, and exactly who we should target. Sometimes when you target people in your own shops you're not targeting the new customers you are trying to get in. So those were the ideas we had to look at and when it came to the decision making it was decided to make the focus a National Craft Bakers week which would commence on 8 June. We were also invited to put ideas forward to involve all the local communities in the areas. The baker used to be part of the community in all the small towns and villages but in recent years the craft baker's influence has probably diminished, with many people buying bread as a grocery item from supermarkets. We wanted to re-invent small bakers in the community. We felt that one way of doing this would be to target the schools, so we set a target for the 5 – 7 year olds, which is top year infants, low year juniors. It was decided that once we had set up the website, which we felt was necessary in

this modern age, the schools could then log on to the website and get information. We also decided we needed a video to be taken inside a bakery and also of course promote to the customers in the shops as well. Now for any promotion to be successful you need a good slogan and a good logo and these were also things which had to be addressed.

The website was set up as www.bakeryinfo.co.uk which is a bit of a mouthful, but if you Google 'Craft Bakers Week' you will go straight into the website. The slogan that the PR people came up with was 'The Shop that Never Sleeps' and it is a fantastic slogan. Later on when we went to schools and into the wide world, that slogan really hit the button because it illustrated exactly what the craft bakers do, how we are working all night, or our staff are if we're not, and then during the day the shop is selling the products made during the night and as well as the bakery making other products during the day. The logo the PR company came up with was also fantastic and once again it caught the imagination of all those who saw it.

The video could have proved more difficult because we felt we needed a professional video showing how the work is done inside the bakery and it would have to be filmed professionally and that would mean it would be quite expensive. Although all the partners on the committee were going to help finance it we wondered if that would be a bridge too far for them. Then Mike Holling, who is a member of your Society, as well as Chairman of the NA, remembered that Thomas Adams Bakery in Northampton had done their own professional video for display in their shops and on their website as part of promoting themselves to their customers. So they were approached to see whether or not we could use some or part of their video and like everybody else involved in this project they readily agreed and were very supportive. They sent the video down to us and we took parts of the video that were related to what we were doing and they were incorporated into the website.



We then decided to email all the State infant schools throughout the country, which was about 20,000 schools. I'm glad it is 2009 because I wouldn't have liked to lick all those stamps about 10 years ago I must admit but in this day and age communication can be done with a flick of the wrist and a push of the button and there are no letters to write and envelopes to post. To make the website more interactive we included what we call 'teachers notes' and an interactive section within the website and we put a Powerpoint presentation on it which the teachers could download. NB Chris then showed part of the Powerpoint presentation to the audience. We also put a Powerpoint presentation on the website for primary school pupils, 5-7 years old covering – baker, ingredients, tip the flour in, talk about the yeast, let it rise, moulding, proving, put it in the oven, take it out baked, and delivery to the shops. The reason we did that was because although the Thomas Adams bakery video is excellent, it was taken in a larger bakery than what

many of us have and this made it difficult for the young children to relate to what we do. However a lot of the schools were able to show the Powerpoint presentation to the children, and when we came in to talk to them we were able to follow on what they had seen in it. By printing off the Powerpoint slides they were able to make up booklets for little or no cost and put them in the class library. So the Powerpoint presentation aimed at the children turned out to be a really good idea.

The main object was to get the craft bakers to work closely with the local schools. They could either go into the local schools or have the local schools come to them for demonstrations in the bakery. The NA's task at this stage was to co-ordinate everything, so once the 20,000 emails went off to the schools I must admit we didn't get 20,000 replies but we got a lot of replies and they all came to the NA. The NA staff then contacted board members or area members and said, for instance, 'we have a school in a certain area, Canterbury, Sidcup whatever, can you find us a local baker to go into the schools'. I was one of the people asked to do this, and every baker that we rang up to ask if they would get involved were very ready and happy to do it. I think that has been one of the successes of this promotion, the way that everybody has been pleased to do something about it.

The other action is to do with radio and TV stations, for if we could get the promotion onto a national stage then it helps a great deal. All the craft bakers who lived close to radio and TV stations were asked to deliver a basket of goodies to them perhaps each day, once a week or during the week, whatever. The committee Chairman Christopher Freeman of Dunns Bakery, Crouch End, has a bakery close to the BBC in London and he turned up every day with a basket of bakery products and we listened to the various radio presenters in the mornings, particularly Wake Up With Wogan on Radio 2, and they kept handing out Madeira cake, cheese batons and other bakery products round the rest of the presenters, so it definitely kept the promotion in the public eye. As I say, we do feel that all the bakers have really been swept up in this promotion, as well as schools and everybody else, and from a countrywide point of view we feel it's been really successful. The schoolchildren have learned what bread is and how it is made, probably for the first time because quite a few of these young children think it's just a product mum picks up from the supermarket and put in the trolley. They don't realize how it's made, the hard work that goes into it, the passion and the love that the bakers give to make the bread. So we have found that the schools have been very eager to join in. A lot of them just used the website, they made up their own lesson plans off the website and some have used the local baker and if he hasn't been able to go and see them then they have spoken to him on the phone and got all the gen and details that they could find. So we do feel that last week really has been a very very good week!

School visits The photographs below show a visit to a school for 9 – 10 year olds, slightly older than the actual target area we were aiming at, but in the end we would go to anybody who was interested. Because they were 9 - 10 years of age we could talk to them in more detail about baking than we would for the 5 – 7 year olds. The teachers were well organized and showed the video and Powerpoint presentation from the website. I then gave them all a little talk about bread, how it's made, and because they were a little bit older you could talk about flour,

wheat and geography, since some of our wheat comes from North America. I also talked a little bit about salt and yeast and the way that yeast works with fermentation and chemical processes, the evaporation of the water from the dough during baking, etc - and the teachers liked it as well because all these things are part of the school curriculum, so it really was very successful. We then moved into the canteen and I had taken along lots of little bags of dough. Every child had a bag of dough and were able to make it into any shape they wanted and you can see the look on their faces in the photograph. I think they enjoyed playing with dough and the flour as much as anything. We were able to bake the dough off in the school kitchens while the children went back to their classes. We marked all the trays with the childrens' names and each child was able to take home a little loaf. However the teacher said a few days later that most of the bread was eaten before they got through the school gate, which was rather nice. But it did demonstrate to the children that these squidgy bits of dough can turn into lovely loaves of bread and they enjoyed themselves very much.



Visit to primary school for 9-10 year olds

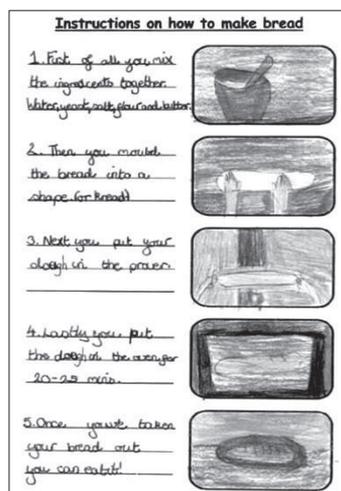
The next day I went to an infant school. The teacher rang me up about two days before hand to say 'we have a problem' and I said 'what is it?' She said that all the teachers want their classes to be involved in your visit, so I said 'how does that leave us?' She said 'with 120 children!' So once again they were well organized and what we did, one afternoon, they took the first class into a separate classroom at the side and showed them the PowerPoint and a clip from the video, and from there they came into a second classroom that we had laid out with flat tables and I had taken a great big bread basket with little lumps of dough which I made as late as I could because I knew the dough would get sticky and soft. They came into us and we showed them what to do with the bread, we spoke about the bread, even these youngsters, not very old, but they were very clued up and we talked about flour, yeast and everything and then it was hands on. The biggest problem was trying to get the dough out of the plastic bags because where it had proved up a bit they had to unwind it and unfold it to get the actual dough out. But that was really good and we had a tight schedule of about 20 minutes each class, and four classes to get through. As one class went off the other class were in, and the next one having their video and then they came in. It all went like clockwork, very well indeed. The NA had also done a big promotion at Christmas on Wallace & Gromit, so I had the Wallace & Gromit posters and



Visit to primary school for 5-7 year olds

of course the kids loved them. I took in displays of bread so they could see exactly what the real bread looks like. So we had two very very good days and I know this was done and copied throughout the whole country. We are waiting for the feedback to come back so we know exactly how successful it has all been.

We put in the teacher's notes on the website a very simple schoolwork form which the pupils could complete which the teachers gave them to take home. Of course children love filling in pictures and had to write beside it the different steps in making bread, see an example of one of the completed forms following.



As you know teachers have to prove what they are doing is worthwhile, so we included a form which the pupils could complete so the teachers could evaluate the lesson, the homework and our visit, which they were very pleased with. The photograph below shows a school visit to our bakery and it doesn't need a caption. You can see from the faces of the youngsters that they just so love it.



Along with the visits to the schools we all had the bakery promotions inside our shops because although we were trying to get people to come inside our shops and try the products, we needed to show them where we all were and make a razzamatazz about it. Below are some pictures from Birds of Derby, who are always very up on promotion work and all the young ladies in the shop wore the Craft Bakers Week T-shirts throughout the week.



Promoting the Craft Bakers Week at Birds of Derby

Then we come to the evaluation and we say to ourselves, 'was it worth it'? Well because this was a different type of promotion things are not going to change overnight. It was a deep promotion where we were trying to get into the schools, trying to get people to rediscover craft bakers, rediscover the products that we make, so the feedback that is coming back now we probably cannot evaluate for perhaps another week or so. But all the early results that are coming in show that everybody enjoyed taking part in it. All the people we met during the time have really enjoyed what they've been doing. George Fuller, of Fullers Quality Bakers, Goole, almost had a documentary about himself on Yorkshire TV, where it showed him in his bakery, showed him in his shop, going in the schools. He had decided to stamp out gingerbread men, because it's a good bit easier when you are taking things into the schools. He got really good coverage on that. A friend of mine, Anthony Kindred, who has a bakery in the London area and is here today, went down to the South of England show to promote his business and he took the message of the Shop that Never Sleeps and Craft Baker week down there with him and they did their promotion work there on fresh foods. Princess Alexandra came along so Anthony was able to talk to her and explain about craft bakers and the Craft Baker Week and so on.

A lot of these things have happened during the week and as I say it's only been 48 hours, so if you look on the website over the next few weeks I think you will find there will be quite a lot of stuff coming in that we will be able to put on the website. We'll be able to put more photos on the website and then we can see what happens. We have tried to get back to restoring the craft baker to, as I say, back to the heart of the community. If you go back 40/50 years there was a bakery in every village and all the people in the village used to bring their Sunday joints along and put them in the oven and that sort of thing. I know we are not quite going to get back to that but we would like the craft baker to raise the profile and get back to the heart of the community. The involvement with the schools, from my own personal experience, has been absolutely tremendous and the schools have latched on to it. I think at the moment the schools are becoming more health conscious with schools dinners and the rest of it, and the teachers themselves are looking for things and ways to involve the children with natural products, and we found that to be really good. As I said, the feedback so far has been outstanding but we are hoping that more awareness can be made of this by people getting to know what proper bread is like and how it is made. It was good to have all these suppliers, sitting round the table at the very start working this out together, because suppliers in the marketplace are very competitive but they were all pleased to work together for the craft baker. As one of the suppliers said, they need us as much as we need them. This was the same for the NA, who normally only have to look after their own members. But on this occasion the NA was looking after all the craft bakers throughout the whole country and I think we have to recognize that the NA does have a huge voice as representative of the craft baking trade.

A baker's shop is "The Shop that Never Sleeps". I still think that is such a good slogan and it makes me think about a little 6 year old when I was in his school going through the demonstration and discussion. I think I must have been piling it on a bit hard because I was saying about bakers working all night, and bakers working all day, and he put his hand up and said "please Mr Beaney, do you ever sleep?" I said that if you ask most bakers the answer will be 'not a lot really'!

The point of this promotion is to put the baker in a positive light. We don't want people to think that the craft bakers are fading out or anything. At the moment it's in a real resurgence and at the NA I think we had 40 new members this year. That's probably the most we have had for ten years. So there is a real resurgence and we've got to try and encourage people to come into the trade, open their businesses and everything. The whole thing is with these schools. I know we joke about the fun they are having, but I usually ask them at the end of the session if anybody wants to be a baker and all the hand go up, yes we want to be a baker. Then I say you get up at two o'clock in the morning and they all start putting their hands down but there are still plenty who do keep their hands up. So hopefully if we do more of these productions and promotions we will perhaps be helping to create our staff for the future because baking is a trade you have to love to do, you have to enjoy doing it, and if we can implant our passion into, especially the young people, then I know we've got a good future.

The last point is that whatever promotion we do, in the end the buck rests with us as craft bakers. We have to make products that people like and want to buy. They won't come into our shops because we tell them they've got to or their children tell them they've got to, they will only come back because they like what we make and so it's really important that we keep our standards up. If we make good quality products that taste nice in the end I think you'll find that the craft baker industry will have a strong future.

*Question: Sylvia Macdonald, Croydon
Lovely to see the craft baking industry promoting itself Chris, it's been needed for years, so my question is do you want it to continue and what might you do differently next year? What have you learned from this year, might you have new videos, what would you do differently?*

Answer: I think next year we would like to open up the schools thing and move into schools where the pupils are slightly older because we have had enquiries from older pupils on that. It would be nice to get more national TV coverage, that's something that we can work on. We had good cover this year but it's nice to look for more coverage. Maybe get more suppliers involved. I think generally until we can sit back in a couple of week's time and look at the results, we can then decide what to do. But I think the answer is we definitely have got to keep this moving on and have another Craft Bakers Week promotion and keep the momentum going.

Sessional Chairman Keith Houliston

I would like to say that with the presentation Chris has presented it's obvious that the work he personally has put in has been fantastic. The fact that he is aiming at the grass roots, he's taken our great trade to the kids, our hope for the future and I think that's to be commended. Thank you Chris.

Our next paper is on "Reducing saturated fats in baked products". The paper was put together by Jo Bruce, who is Research and Development Manager at ADM Trading. Unfortunately due to illness Jo can't be with us but her colleague Steve Knapton, who is known to many of us, will read Jo's paper. Steve is a qualified baker who has worked in the industry for almost thirty years and for the last fifteen years he has been very much involved in oils and fats. His present position is Regional Sales Manager for ADM Trading and Steve

has significant industrial experience in the replacement of saturated fats in bakery products and in the development of low- and non- saturated fat formulations. The Food Standards Agency launched a public education campaign earlier this year to help persuade consumers to reduce the amount of saturated fats in their diets. In addition discussions within the industry have been underway to identify what level of reduction is possible and practical in a wide variety of food products. Can I introduce you now to Steve Knapton.

Reducing Saturated Fat in Baked Products

Johanna Bruce

(presented by Steve Knapton)



Thank you. I would like to apologise on Jo's behalf for her absence from doing her presentation today due to illness and I am pleased to say that she is back on the road to recovery.

This presentation will look at saturated fat reduction in bakery products - the fats you use for a wide range of bread, confectionery, pies and pastries.

The Food Standards Agency has started a campaign to reduce the saturated fat intake of the UK population and this presentation will give some advice on what you might consider doing to meet the reductions required. First I will give you some idea of the targets the FSA are currently considering. Then we will talk about all purpose shortenings which are used in a very wide variety of bakery products and will also look at fluid shortenings. You probably have come across fluid shortenings supplied in bulk previously but we are now starting to look at them for a wider range of applications, particularly in short pastry, because this is one way of reducing the saturated fat level. We'll also look at puff pastry and other areas where saturated fat reduction may be possible.

Food Standard Agency Targets

- The Food Standards Agency has set a target of reducing saturated fat intake among the UK population from a current average intake of 13.4% to below 11% of food energy by 2010
- A 20% cut in saturated fat across the population is estimated to save 3,500 lives per year, due to the reduced risk of heart disease and stroke
- Like the salt campaign, changes by industry will also be backed up by health education campaigns, but industry action is more likely to achieve real reductions for highest risk individuals
- The bakery sector is the first to be targeted, but will be followed by targets for dairy, meat, spreads etc. later in the year

If you look generally at the saturated fat contribution to the UK diet, meat and meat products are highest in saturated fat with

Saturated Fat Contribution From UK Diet		
Contribution	Product % saturates	/ % of energy
Meat & meat products	22% (adults) 13-24% (children)	/15% (adults) /10-16% (children)
Milk	9% 7-18%	/5% /4-9%
Cheese	10% 5-10%	/3% /2-3%
Ice cream	2% 1-3%	/na /na
Fat spreads (inc. butter)	11% 7-9%	/4% /3-4%
Biscuits, buns, cakes, pastries, & fruit pies	9% 7-12%	/6% /7-12%
Pizza toppings	2% 2-4%	/na /na
Potato crisps, snacks	3% 6-9%	/na /4.6%
Chocolate confectionery	5% 7-10%	/2% /4-6%
Potato products	3% 3-5%	/5% /4-7%
Source: FSA, Saturated Fat Consultation, 2006		

22%, but biscuits, buns, cakes, pastries, fruit pies, are also quite high at around 9%. As large quantities of both meat products and bakery products are consumed, they contribute significantly to our total saturated fat intake. Meat products and bakery products to a certain extent go hand in hand, because a lot of meat products are made using pastry, so reductions in the saturated fat content of pastry fats can be used to reduce saturated fat in both applications.

The FSA has been discussing recommendations for saturated fat reduction with many food groups, including the bakery industry, for the past year. Most people here will have been represented by the Food & Drink Federation or perhaps as individual companies and we have also been in discussions with the FSA. The FSA have not yet opened the full public consultation but it is due very soon. I think they are just refining the economic impact assessments at the moment before publicizing their recommendations.

Possible FSA Bakery Targets

Consultation has not been published, however expected recommendations are:

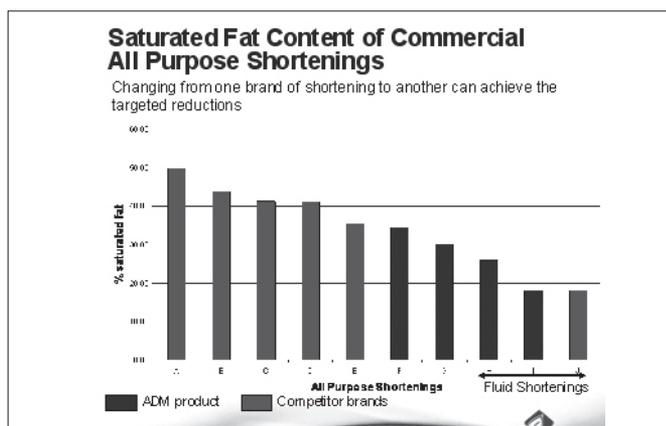
- Short crust pastry (one or more of the following):
 - Reduce fat addition level a little, perhaps by 5%
 - Use best practice and lower saturated fat products on the market
 - Move to fluid shortenings where possible
- Cakes and Crèmes (confectionery fillings made from shortening, marshmallow, fondant, icing sugar, etc, according to recipe used, beaten up to give a light cream for sandwiching and piping)
 - Reduce saturated fat to levels available on market
- Buttercreams (confectionery fillings made from butter, marshmallow, fondant, icing sugar, etc, according to recipe used, beaten up to give a light cream for sandwiching and piping).
 - Because butter must be the only fat in the recipe to allow the 'buttercream' description, no reduction in saturates is possible, other than changing to a confectionery filling and not using the buttercream description.

- Puff pastry:
 - Reduce laminating fat inclusion slightly
- Biscuits:
 - Modest saturated fat reductions expected, although 50% known to be achievable
 - Little reduction possible in hard crèmes (HPKO equivalents)
 - Very slight reduction in saturates in chocolate through changes in CBE (cocoa butter equivalents)

These are the sorts of areas that we think will be targeted. For short crust pastry we would expect an energy reduction, for example by reducing fat level by 5%. We'd also expect manufacturers to have to use best practice shortenings or at least lower saturated fat products already available on the market. In some areas, a move to fluid shortenings might be recommended. On cakes they are looking for a potential 10% reduction in saturated fats; creams a 10% reduction again. So, all the things that we like are slowly going to get better for us. Butter creams are a stand alone product so it will be very difficult to change without changing the whole nature of the product.

For puff pastry we think they may recommend reducing laminated fat inclusion level by possibly 10%. These percentages are just general indications that we have been working on. If you look at biscuits, again a 10% reduction in saturated fats to around 42% might be expected. Up to 50% reductions are possible. Biscuit crèmes are going to be difficult areas to reduce. The types of fat used, hardened palm oils and palm kernel oil equivalents are by their very nature high in saturated fats. For chocolate coatings there could be changes in CBEs (cocoa butter equivalents) to give slight reductions in saturated fat but no radical changes will be possible just by altering the fat.

All purpose shortenings Shortenings are 100% fat and are used in a wide range of products - cakes, short crust pastries, crèmes, biscuits, and dough fat for puff pastry. Therefore most of the reductions recommended by the FSA could be achieved by changes in shortening formulations. We took a number of shortenings available to the baking industry from our own company and from other suppliers and analysed them for saturated fat level. It is not an exhaustive list but the graph below gives you a general indication of the saturated fat level of a cross section of shortenings used in UK bakeries.



The saturated fat level ranges from around 50%, down to, with the boxed shortening, around 30%. The saturated fat level drops further to around 26% and 18% with fluid shortenings. Leaving

aside the fluid shortenings for the moment, which we will discuss later under short pastry, it can be seen from the graph that there are lower saturated fat level boxed shortenings available which could help achieve the saturated fat reductions desired by the FSA. This assumes that they have the same functional properties and performance as the higher saturated fat shortenings and this is claimed by the manufacturers. It is worth noting at this point that the level of saturated fat in shortenings increased with the removal of hydrogenation from the manufacturing process. The trans-fatty acid problem with hydrogenated fats caused a move to non-hydrogenated fats but a consequence of this was an increase in saturated fats in the shortening blends to retain product functionality.

Changing from one brand of all purpose shortening to another boxed shortening with a lower saturated fat content could allow you to achieve the FSA targets but are all these shortenings the same in terms of performance and functionality? We've carried out some tests on the range of shortenings available to look at the properties which might affect your products, see following:

Effect of fat formulation on functionality

- Fat texture – affecting dispersion & creaming properties
 - Firmness
 - Plasticity
 - Shelf life stability of crystal structure (crumbliness/brittleness)
- Stickiness/sheeting properties of pastry
- Cakes – volume/dry/pasty/damp layers/mouth feel
- Pastry/biscuits – crispness/firmness/shelf life
- Oil exudation

We used standard test methods to see whether reducing saturated fat has a radical, or even slight effect on functionality.

Solid fat content of all purpose shortenings NMR is used to measure how much solid fat you have in a shortening at various temperatures and this gives some indication of how firm the fat will be in use. The test results showed that the lower saturated fat products have slightly lower solid fat content at room temperature. All the solids are between 20 – 25%, so they are all very similar, to give you a benchmark, to butter.

Although the NMR values suggest that lower saturated fat products will be softer it is not as simple as that. How you process a fat has a significant impact on how firm it is and how it retains its firmness over time. So it's down to what we can do as fat manufacturers. A shortening with a good formulation should not go brittle and form lumps and needs to stay soft enough to readily blend into the other ingredients in your recipe. Functionality is all about good distribution of the fat in the batter or dough.

SMS Analysis SMS is an analytical test which gives a measurement of fat firmness. From the samples tested you can see wide variations of firmness. However this doesn't give you all the information. Like many of you, we have bakers with years of experience who will feel the fats and assess how they work in your processes. Looking at the results of this analysis you tend to think that some of them, for example the firm one at 550 on the SMS scale is not going to be as good, but that was actually a very good product, so it's about feel as well as firmness.