

European developments in freezing technology

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Since I left the UK for another job within our organisation in 1990, I have visited a great number of bakeries worldwide.

I must say, looking back on my experience, that the German bakeries are in the front of row of making use of refrigeration equipment. When you ask a German baker what importance such equipment may have in his bakery, the typical reply is: "Second after the oven, because without the oven I am out of business! But without refrigeration equipment, I can't run my company any more, in respect of economics and keeping staff under control, when you can get them. It's hard these days to get staff and when you got them and paid them well, it's always the question - is he or she showing up the next day? Apart from solving staff problems, the equipment gives me a consistent product full of flavour."

I don't mean to be meant impolite towards staff, but I think that the majority of you recognise this experience, because it's a worldwide problem.

So the question now is, what can refrigeration equipment do for you? I will not fully explain the working as such of a retarder prover, because that type of equipment is well known to the most of you. The temperature range of such installations is from +40⁰C down to -17⁰C but it is their size which is important.

Based on loading the unit with rolls, morning goods, and French baguettes, let's say up to a product weight of approximately 350 grams, it must be able to contain four times the oven capacity in use for such products. In other words, we advise loading the unit with up to 80 minutes' worth of baking time for reasons which I will explain later.

You will observe that the unit has one temperature and one relative humidity, and you can say that you will not be able to bake the products off - but there is a solution for that.

First, you have to balance the yeast level of the various products you will bake first. As many of you will know already, a French baguette proves faster than for example a roll, due to its surface area. So you have to reduce the yeast content of the baguette and probably slightly increase the yeast level of the roll.

Both products will now prove at the same rate - no difference in height. Oven load number one and oven load number two will have the same yeast content.

We advise the customer to prove the products at a temperature of about +25⁰C during the automatic process - a rather cool proving temperature.

The following bakes, three and four, must be balanced in the same way as bakes one and two, but in this instance we have to reduce the yeast level compared to bakes one and two by approximately 0.4% to account for the 40 minutes of baking time.

I am saying 40 minutes, because, in our example, each bake will take 20 minutes, including loading and discharging the oven, walking from the oven to the dispatch area with the rack and back again to the retarder prover.

The yeast difference between bakes one and two and bakes three and four is only necessary for the products loaded in the retarder prover and in fact happens only at that one stage. All other products can be done in the normal way, allowing for the fact that the products have to prove equally.

As indicated (showing a bakery floor plan), we are considering a company which has two rack ovens, but they may also be deck oven. The retarder prover has a capacity of eight British racks, tray size 18in x 30in.

To make the system work, without moving racks around, it would be ideal for the unit to be free-standing, so that it also can be loaded from the rear.

Now let's look at a recovery unit with a temperature range +15°C down to -20°C. this type of unit is nearly doing the same thing as a dough conditioning unit or retarder prover can do. The difference is that the unit

will not prove the products.

The unit may be loaded with fresh and/or frozen dough pieces. So it will blast freeze, store and recover or defrost the product by pre-set temperatures and time. From a certain size upwards, this type of unit is specified with a humidifier system, but can still not prove the products as such.

The size of the equipment is based, together with the dough conditioning unit or retarder prover, on the busiest day of the week. That means that during the week the unit is oversized. Despite this, it is worthwhile to invest in the larger size. Generally, the price difference between a smaller unit and one with the capacity required for the busiest day in the week can be disregarded.

What you now can do, of course, is load both units in the way that you are used to doing with the retarder prover only.

The correct programme or pre-settings must be made daily. By returning the next day, you start first by unload mg two racks ready for the ovens. Now move the remaining six racks up and you will have space for two racks at the rear.

Take these two racks from the recovery section and place them in the retarder prover. The retarder prover will now be used as final prover, to suit the remaining production requirements of the day.

You will get an additional baking system this way. It is possible to run 95-100% of your daily requirements through these two units.

In this continuous baking system, you will find that despite the fact that there are two more energy consumers in the bakery, the total energy consumption will decrease, due to the fact that the ovens will be used more efficiently.

There are no gaps between bakes any more. And besides that, you can start later and having the full fresh variety available at the right time.

I have not spoken about one and two pound loaves or even heavier as they do in Germany. Yet it is possible without any technical problems. The thing is, however, that your profit margin does not allow you to invest so much on that type of bread!

Morning goods are much more financially interesting to you and there it *is* possible. Please bear in mind here that it takes a minimum of three times longer

to produce rolls and baguettes of up to 900g of dough weight than one loaf of the same weight. This type of equipment must be used to take all problematical type of products out of the early morning production and prepare them during daytime, which is much cheaper and avoids production peaks.

When those doughs are produced during normal day hours, after delivery of the daily requirements of your customers and the shop, you are giving much more attention to dough mixing, which can in itself increase the quality.

One or two further technical observations. Generally we get the customer commenting, shortly after delivery of the equipment, that the products are faster colouring. What we are doing in fact in this type of equipment is slowing down or stopping the yeast working. The freezing point of yeast, depending on the recipe, is round -4.5°C to -6°C . All the other raw materials are working all the time. Even at -20°C , sugars are still multiplying and that causes faster colouring.

Here also there is a solution - just drop the oven temperature! How far depends on the quality of the thermostat - I have experienced anything from 5 to 30°C . But that is not really the point. What's important is to maintain the baking time under all circumstances. Never shorten that, because otherwise the product will not be cooked in the centre. I am deliberately talking about cooking, because the inside of the product in fact will not be baked as such.

Another important point is recovery/proving time in a retarder prover against recovery in a recovery unit. For the first type of equipment mentioned I advise a minimum of 8-10 hours to take morning goods from -2°C to $+25^{\circ}\text{C}$. For just recovering the products in a recovery unit from -2°C to $+9^{\circ}\text{C}$, I also recommend 8-10 hours.

When these yeast doughs slowly increase in temperature, the longer fermentation will take. The better the texture and the flavour.

Back now to recovering the products. I just mentioned storage at -2°C and recovery up to $+9^{\circ}\text{C}$. That's what we advise our customers, because it avoids the risk of dehydration or skinning. Why then the setting of $+15^{\circ}\text{C}$? One answer only - for Germany. The German bakers have a very flexible type of dough with generally rich recipes. They are the only ones who can afford to use higher temperatures.

To prove the products, from +9⁰C up to a fully proved product at +25/26⁰C, will take on average about 80 minutes and that is the reason why we advise our customers to go for four oven loads in the retarder prover.

When one or two pound loaves are involved, the story is totally different.

am sorry not being able to tell you more about it, due to shortness of time, but I can provide the data afterwards.

A step further now. Let's say that you have, or intend to purchase, a blast freezer and a dough storage freezer. What you now can do is to over-produce from Monday to Friday to cater for a busy Saturday.

The normal quantity can be produced, while the over-production will be blast frozen and stored in the dough storage freezer. On Friday, the pre-produced product is available for Saturday.

When you are open on Sunday, why not over-producing also for then, or ii you wish also for the Monday? It means that all products are in stock.

No extra time is needed to prepare them in the expensive hours and you need fewer staff in the bakery at that time. After recovering and proving you only have to bake the products, despatch them and go home to enjoying the weekend.

How the combined coldroom is sited is often the linchpin in a German bakery. You have similar equipment as in the main bakery I have shown, albeit that the sizes are smaller, because it is based on the turnover of the shop and you don't need the blast freezer.

The size of the dough freezer can be based on resupply once, twice or three times a week, although the larger it is the less driving, which of course is a cost saving.

I advise you to produce dough pieces in the main bakery, blast freeze them and prepare them in the storage area for transport to the shop. I am thinking of loading the various dough pieces in plastic bags, in plastic baskets and stack-lug them. When you wrap the stacks in foil and the distance is not more than, say. 30-45 minutes, it is not necessary to have a refrigerated van or lorry, in particular not when the stacks are well packed and loaded. If the vehicle is insulated, temperature loss during driving can be ignored.

Load these stacks in the combined dough storage freezer and recovery unit in the shop. The baker can daily take from his available stock, unpack the stacks and bags, tray up the products. put them on a rack and load the racks in the recovery section and the retarder prover.

In fact the baker is working in a similar way as in the main bakery. although in this system it is important to have a qualified baker in the shop because too many things can go wrong and limited control from the main bakery is possible.

Besides needing a qualified baker in this shop, there is another negative point - it requires space which iii most situations is not available. The capital investment is also high.

There is a better and cheaper solution by way of a combined dough storage freezer and recovery unit. Now no retarder prover is required.

How does this system work? Produce the dough pieces in the normal way, prove them for about 80% of the normal proving time, blast freeze them, store them and prepare them for transport in the way I mentioned earlier. Of course, these dough pieces do require more space due to their volume.

Shop staff can unpack and tray up the dough pieces today for the requirements of tomorrow and load them in the recovery section. The temperature setting of this unit should be about -1 or -2°C. The products can be loaded from this temperature directly into the oven the next day.

For this system, I advise a computerised pre-programmed oven. One shop lady, with one day's training, can handle the system and still serve the shop. No qualified staff are necessary, because she can't go wrong. The only thing to do is to empty the oven when the bell rings.

Less space is required and another advantage is that, because the temperature in the recovery section is -1 to -2°C, products not sold that day can be sold the day after. There are no further losses and an absolute minimum of leftovers or returns.

From a bakery technical point of view, no special recipes are required. Generally the yeast content is slightly lower than normal. One thing, however is important. The quality of the flour must be good - which has usually been my experience here in the UK.

Blast freezing (if pre-proved dough takes longer compared to a solid dough piece, but it takes less time compared to a part-baked or fully baked product. For pre-proved dough pieces it's important to blast freeze fast and well, thus avoiding further fermentation and larger ice crystals.

I now would like to switch to blast chillers and blast freezers, for both craft and industrial use. My company has produced batch blast chillers and blast freezers for craft bakers for decades now. Basically they are units ranging from about 30kg per hour to hundreds of kg.

From a basic design we tailor our equipment to specific customer requirements. In particular the blast chill requirements have increased, due to new legislation in the UK and EU laws

In general products with cream, meat and other fillings, from a high temperature range of +10 to +95°C or higher, must be chilled within 90 minutes.

Depending on the type of product, dimensions, temperature and so on, chilling can at course be done in a shorter time. It is important that all products must nearly be equal in centre temperature, not only on the top of the rack, in the middle and at the bottom, but also from the front to the rear.

After blast chilling, the products have to be packed and stored at the correct temperature. One is obliged these days to prove that the storage temperature is correct. Our equipment can be connected to an auto-dial modem system, which provides this facility. You can print off this information for the last 48 hours at an external printer, and it can be taken as legal evidence.

Industrial blast freezers range upwards from about 250kg of product. These days there are batch blast freezers, for racks, with or without automatic transport system, single belt blast chillers and freezers or multi-deck types, as well as paternoster systems. These are suitable for producers who are producing on trays in a continuous production process.

The multi-deck units are suitable for larger producers in a continuous production process, producing various production lines simultaneously. The belt speed can be adjusted per level. A lot more could be said, but unfortunately time is limited, Quality and cost control are essential in markets with fast growing competition among suppliers and increasingly high demands from the customer's side.