WHAT ON EARTH IS DOUGH STRENGTH?

Historically a baker tested the strength of a dough by stretching a piece of it, feeling how hard it was to stretch, and seeing how far it stretched without tearing. Through experience, he knew whether or not it would make good bread, and how to manipulate conditions to improve doughs which he judged to be inferior.

In modern bakeries, there is no time to adapt conditions to suit variations in flour quality, and it has become the role of cereal chemists and millers to provide flours of consistent bread-making quality. Some of the tests they use imitate the way bakers test dough strength.

In dough testing laboratories and flour mills, dough strength is determined by the Brabender Extensograph, which records on a chart the force required to stretch a cylindrical piece of dough with a hook moving at constant speed. Dough strength depends both on the amount of protein in the flour, and on the quality of the protein. The maximum force reached as the dough stretches is known as the maximum resistance (Rmax), and for bread-making flours, should be greater than 300 Brabender units (BU). The acceptable range is 250-400BU for Australian bread flours, while 120-220BU is preferred for biscuit and cake flours.

The apparatus also records how far the cylindrical dough piece stretches before breaking. This distance (in cm) on the chart is termed the extensibility and is a measure of the dough’s elasticity. Extensibility values between 17 and 20cm are preferred, up to a maximum of 24cm for Australian bread flours, while a value of at least 16cm is preferred for biscuit and cake flours. (Note: there can be calibration differences). Cake and biscuit flours are required to be low in protein, low in maximum resistance, and highly extensible. Other flour types have different requirements for characteristic patterns of resistance to stretching.

Dough strength also influences mixing behaviour. This is determined on a recording mixer called a Brabender Farinograph. Knife-like zigzag rotating blades chop through the dough, and measure the torque on the dough. The dough is adjusted to a standard consistency by adjusting the water level till the farinograph reads 500 Brabender units, and recording how much water was added. This is generally between 60-66% of the flour weight, and is known as the water absorption to peak consistency. Another dough is then made using the same amount of water, and this dough is used in tests to measure dough behaviour.
The time taken to reach peak consistency is also important. As measured in the Farinograph, a minimum of 4 minutes, and generally 5-7 minutes is required for Australian flours. Bakers don’t want to mix too long because it consumes power and slows factory throughput. Dough mixing is not just a question of dispersing the ingredients, but the work input is necessary to develop the physical structure of the gluten fully. It is better to be a little over than to have an under-developed dough, although it is also important not to mix too far past peak consistency because, if this happens, the dough can deteriorate. Tolerance to under- or over-mixing is thus a desirable property of a flour sample.

To sum this up, processors generally want flours that absorb a lot of water, and with protein properties that allow a fast rise and slow fall in dough torsional consistency measured on the Farinograph. Bread, noodle and biscuit manufacture call for different ideal dough strength characteristics.