A "Toolbox" for the Reduction of Acrylamide in Bread Products

Acrylamide
Acrylamide is a substance that is produced naturally in foods as a result of high-temperature cooking (e.g. baking, grilling and frying).

Acrylamide has been found in a wide variety of cooked foods, including those prepared industrially, in catering and at home. It is found in staple foods such as bread and potatoes as well as in other everyday products such as crisps, biscuits and coffee.

Acrylamide in food potentially increases the risk of developing cancer for consumers in all age groups. It is therefore of major importance for the protection of public health that mitigation measures are applied to reduce the levels of acrylamide in food as low as reasonably achievable.

The FoodDrinkEurope Acrylamide Toolbox
Following the discovery of acrylamide in food, the industry and other stakeholders, including regulators, took action to investigate how acrylamide is formed and possible methods that can be employed to reduce levels of acrylamide in foods using the ALARA principle. FoodDrinkEurope initiated and continues to coordinate efforts and pool results together to update the Acrylamide Toolbox.

What does the Toolbox do?
- Details existing methods to reduce acrylamide in foods
- Allows users to assess and evaluate which reduction measures to use at which production step
- Assists in implementing Commission Regulation (EU) 2017/2158, with the aim to achieve levels of acrylamide as low a reasonably achievable

ALARA
ALARA is an acronym for the concept "As Low As Reasonably Achievable". This simply means that a Food Business Operator (FBO) takes appropriate measures to reduce the presence of a given contaminant in a final product to a minimum: taking account of the risk presented, but also taking account of other legitimate considerations, such as potential risks from other contaminants, organoleptic properties and quality of the final product, and the feasibility and effectiveness of controls.

To ensure continuing compliance with the ALARA concept the FBO should monitor the effectiveness of the implemented measures and should reassess these as necessary.

What can you do?
- Use this brochure to identify methods that you can use to reduce acrylamide levels
- You will need to examine your production methods, recipes, product quality and national legislation in order to identify the most appropriate "tools".
- Consider that not all methods will apply to your manufacturing needs
- You will need to assess the effectiveness of the mitigation measures by monitoring and use of the benchmark levels as performance indicators
- When benchmark levels are exceeded, you will need to review the mitigation measures applied and adjust processes with the aim to achieve levels as low as reasonably achievable below the benchmark level.

Acrylamide in bread products
This brochure is designed to help bread manufacturers.
For further advice please contact AIBI aisbl - International Association of Plant Bakers at info@aibi.eu

Read the full toolbox at:
https://www.fooddrinkeurope.eu/publication/fooddrinkeurope-updates-industry-wide-acrylamide-toolbox/

Methods of formation
- Acrylamide is formed via the reaction of asparagine and reducing sugars (both naturally occurring in cereals)
- Acrylamide is formed at temperatures higher than 120°C
- The amount of acrylamide formed depends on
  - Temperature
  - Baking time
  - Recipe

Methods of Reduction for Bread Products

The following “tools” have been used successfully to reduce levels of acrylamide in bread products. Manufacturers are advised to select those “Tools” that are most suitable to their type of product, process methods and product quality specification.

Raw Materials Selection	Recipe Design	Process Design	Finished Product Attributes
• Sugars composition of cereal grains is not a key determinant of AA formation. • Sulphur-deprived soils have been shown to impact the free Asn concentrations in certain cereal crops considerably. Less sulphur in the soil results in higher Asn levels in the crop and therefore higher risk of AA formation. Cooked wheat prepared from sulphur-deficient flour also impacts the spectrum of aroma compounds, and consequently the organoleptic properties.	• Some pre-processed ingredients may already contain high levels of acrylamide which could impact upon levels in the final product. • When raising agents are used, replacement of ammonium bicarbonate sometimes works. Alternatives are potassium carbonate with potassium tartrate or disodium diphosphate with sodium bicarbonate. • The addition of calcium salts (calcium carbonate or calcium sulphate has shown to reduce the formation of acrylamide. • Asparaginase is to try for certain products e.g., crispbread. • If less wholemeal flour is used less acrylamide will be formed. This is not desirable from a nutritional and taste point of view.	• Baking at a lower temperature for a longer time, but to the same final moisture content has been effective in lowering acrylamide in some products. • Adjust the time and temperature during baking to avoid excessive browning of the crust.	• There may be an impact on loss of stack height, flavour or texture. If sodium salts are used as an alternative take care not to end up with excessive sodium in the finished product • The product will inevitably have a less dark, less ‘baked’ colour. • Take care not to underbake the product as this could lead to microbiological problems on storage.