NovaFrit GmbH

Founded: 29.02.2000

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Presentation: Bernd Nockemann
Circulation Deep-Fryer

• A New Method of Deep-Frying

• Composition and Function of a Circulation Deep-Fryer

• First Results
Target Ambience:

• Temperature as close as possible to the desired value

• Homogenous distribution of the energy

• Overall heat exposure to the fried product
Conventional Deep-Fryer

Circulation Deep-Fryer

Natural Convection

Forced Convection
Conventional Deep-Fryer:
- Natural convection
- Small heating surface
- Needs high energy storage / plenty of fat = high ratio fat: food
- High pyrolyse

Circulation Deep-Fryer:
- Forced convection
- Large heating surface
- Needs low energy storage / small amount of fat = low ratio fat: food
- Low pyrolyse

- Other options and effects
Circulation Deep-Fryer: Other options and effects

- Flexible, easy regulation of temperature caused by optimum forced convection
- Optimised cooking and heating time with low thermal load
- Permanent filtering
- Well defined end of the frying process by leading the fat to a storage reservoir
- High grade automatisation requires low grade attention of the operator
- Built-in model possible, space saving, easy to maintain, easy to clean
- High system compatibility
- Low energy consumption
- Low amounts of acrylamide

- Automatic refreshment
Automatic refreshment:

- Fat and solved substances are carried out with the fried product.
- Fresh fat is added continuously.
- The amount of solved substances moves to an equilibrium.
The quality of the fat remains constantly on a very good level:

- CF3 2001: Ratio 1:4.4
- CF4/LF 1.0: 2003: Ratio 1:2.6

24%: Point of Change
Implications of the automatic refreshment:

• Change of the hole quantity of fat no longer necessary

• Fat consumption reduced to 1/2 or even to 1/3 (if there isn’t any fat quality management)

• No disposal of fat, compatible with environment

• Attention to fat quality no longer required, first time complete process reliability

• Deep-frying in spoiled fat is no longer possible with this method
Acrylamide Content in French Fries: Spot Checks

Significant Amount: 570 µg/kg

Acrylamide (µg/kg)

Number of Frying Processes

<table>
<thead>
<tr>
<th>Process</th>
<th>Acrylamide (µg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (175°C / 3' 10&quot; / 1,100 g)</td>
<td>60</td>
</tr>
<tr>
<td>50 (175°C / 2' 50&quot; / 1,100 g)</td>
<td>&lt;30</td>
</tr>
<tr>
<td>100 (175°C / 2' 45&quot; / 1,100 g)</td>
<td>100</td>
</tr>
<tr>
<td>150 (175°C / 2' 50&quot; / 1,300 g)</td>
<td>&lt;30</td>
</tr>
<tr>
<td>200 (175°C / 3' 00&quot; / 1,300 g)</td>
<td>&lt;10</td>
</tr>
</tbody>
</table>
Acrylamide Content in French Fries: Higher Temperature

Significant Amount: 570 µg/kg
Construction and function:

- **Construction**

![Diagram of a deep-frying container with labels for Basket, Overflow, Filter, Storage reservoir, Heating device, Measurement of fat level for automatic supply, Pump, Control, Deep-frying container, and Control.](image)
Construction and function:
• Heating up / small circulation
Construction and function:

- **Deep-frying process**

![Diagram of deep-frying process with labels: Basket, Overflow, Filter, Storage reservoir, Measurement of fat level for automatic supply, Pump, Heating device, Deep-frying container.]

Hagen, 13.01.2004

Bernd Nockemann
Construction and function:

- **End of frying process:** Fat flows off to a storage reservoir

![Diagram of deep frying container with labeled parts: Basket, Overflow, Filter, Storage reservoir, Measurement of fat level for automatic supply, Pump, Deep frying container, Heating device.](image-url)
Example for progression of temperature

- Heater out
- Heater in

Time

Temperature (°C)

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Time requirements:

Heating up (20 - 175°C): 9 min.

Deep-frying process: 2.5-3 min.

Flow off: 15 sec.

Heating up for next frying process: 40-70 sec.

Heating up from stand by (140 - 175°C): 2.5 min.
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