A Cheesy Tale

For 400 years the slide rule was an invaluable calculating aid. But there was another side to Oughtred's invention. It proved highly adaptable and was used in many diverse ways …. even cheese making!

Introduction

For centuries the Dutch have been renowned cheese makers. The Netherlands annually exports over a million tons of cheese. It is the second only to Germany as exporter of the most cheese within the European Union (EU) [1]. Traditional Dutch cheeses such as *Gouda* and *Edam*[1] are known all over the world. Possibly less well-known are the many Dutch regional cheese specialities such as *Leidse* (with caraway seeds) or *Friese Nagelkaas* (with cloves and cumin).

A Dutch slide rule for cheese making

In the EU over 90% [1] of all cheese is made from cow's milk - although cheese can also be made from ewes, goats or water buffalo milk. Cheese making is a natural process with many variables and ways the cheese maker can influence the look and taste of the final product. This means there are thousands of different cheeses. They range from subtly flavoured soft and creamy cheeses like *Brie* to "rock-hard" intensively flavoured cheeses like *Parmigiano-Reggiano* (generically known as *Parmesan*) that has to be grated. Despite this variety one common trait all the different cheese makers have is that they all want to maximise the amount of cheese they make from every litre of milk. So in the 1930/40s a slide rule was developed to help Dutch cheese makers work out what the optimum yield was.

Closed frame boxwood 38 x 4.5 x 0.8 cm specialist slide rule to calculate the optimum yield in kilograms of cheese per 100 litres of milk

According to the top left-hand corner the slide rule is a: "*Syst. K. Von Henning*". It has no cursor and never needed one as there are no cursor tracks in the top and bottom side edges. It is unusually constructed since the tongues on the sides of slide are on the bottom rather than centralised. This means the slide is not reversible. But this is unimportant as the layout only consists of the four scales on the front face.

[1] Edam cheese is only sold outside The Netherlands with the characteristic red paraffin wax coating.

All the scales are logarithmic and from top to bottom they are:

- **A** **250–380** scale for the butterfat content of the full fat[2] milk used (representing a % range from 2.5 to 3.8)
- **B** **55–0** reciprocal scale for the chosen butterfat % of the cheese curd
- **C** **35–60** scale for the targeted water content % of the ripened cheese
- **D** **6-14** scale for the yield in kilograms per 100 litres of cheese-making milk

K. Von Henning

Other than the text labelling being in Dutch, there are no distinguishing marks or logos on the slide rule. So apart from being from The Netherlands, the maker is unknown. Also, dispute being an unusual surname, details about the apparent designer, *Von Henning*, are equally sketchy. However, there is strong circumstantial evidence that it may have come from a company set up by **Karel von Henning** (1896-1955) [2]. He was a successful poultry farmer. By 1935 he had established a factory in the town of Wezep in Gelderland. They supplied feedstocks to the poultry industry [3].

Photo of *Von Henning's* factory circa 1935 in Wezep [3]

Tellingly the factory was more than just a feedstock supplier. The factory had a laboratory and did its own chemical and biological research to help poultry farmers make their business as profitable as possible [3]. As the surname, timeline and the country of origin fits, conjecturally the laboratory branched out and started helping cheese making farmers and the cheese industry.

Using the scales

In industrial-scale cheese making milk is first pasteurised. However, for cheese made on farms or from milk directly sourced from farms, raw unpasteurised milk is used. Such cheeses often carry the hallmark "Farmhouse". However, this is not a controlled or trademarked term. So an industrially made cheese can equally be called "Farmhouse". But in the EU since 1992 certain cheese types, like *Gouda* from Holland and *Parmigiano-Reggiano* from Italy, have been granted "Protected Geographical Status" stopping other countries marketing their own same name versions [1]. The one rule-of-thumb is that wax-covered cheeses are typically industrially made whereas cheeses with a rind are more likely to have an artisan provenance. A full description of the cheese making process falls outside the scope of this article and the knowledge of the author. Needless to say the scale layout on the *Von Henning* slide rule takes into account **three** of the key characteristics in cheese making that make different types of cheese appear and taste so different [4]:

[2] Commercially retailed milk is sold as: (i) full fat, (ii) semi-skimmed or (iii) skimmed.

1. Butterfat percentage of full fat milk – scale A

The type of cheese produced is initially driven by the butterfat content of the milk. In the heyday of the slide rule the butterfat content of full fat milk was less controlled and could fluctuate wildly according to the season, bred of cow, type and quality of the pasture for grazing, etc. In Holland the butterfat content of commercially retailed full fat milk is now legislatively set at 3.5%. Some other countries define the full fat milk percentage sold in shops slight differently but commonly it is set somewhere between 3.25% and 3.70%. Full-fat milk from cows on a farm can easily be 4% or more butterfat. In the past full fat milk was mostly used in cheese making but today many popular cheeses are made from skimmed milk. It is an oversimplification but the higher the butterfat % of the milk used, the softer the resulting cheese is.

2. Butterfat percentage of cheese curds – scale B

To make cheese milk is first heated and encouraged to sour or curdle so it splits into semi-solid blocks of cheese curd and the liquid whey. How far this process is taken affects the butterfat content of the cheese curd. These days in Holland a low butterfat % is a "healthy eating" marketing tool and accentuated on any labelling. For example, cheese is sold as having a butterfat % of: 10+, 20+, 30+, 40+, 45+, 48+, 50+ and +60. Many other countries use less precise definitions. For example, cheese being marketed as "low-fat" (≈ 20+ or 30+) or "high fat" (≈ >45+).

3. Water content percentage of the cheese – scale C

After the semi-solid blocks of cheese curd have been cut up[3] they are put into moulds or wrapped in cheesecloth. They are then pressed to remove more of the residue water content and the ripening process can start. Ripening or maturing can be as short as a few days or can take years. Depending on the length of time allowed and the conditions prevalent in the storage area for ripening, the water content % will, over time, reduce through evaporation and the cheese shrink and harden. For example, a semi-soft cheese such as *Brie* the water content could be 55-80%. Whereas a semi-hard cheese like *Gouda* would have a water content of just 45-50%. For extremely hard cheeses like *Parmigiano-Reggiano* the water content is as low as 25-30%.

Calculating the optimum yield

As is often the case with specialist slide rules, the "clever part" was designing the non-standard scales and the layout. Once the purpose of the scales is understood, using the *Von Henning* slide rule for cheese making is "child's play". To calculate the optimum yield takes just two simple steps:

1. Find and align the desired/chosen butterfat % for the cheese curd on scale **B** under the butterfat % of the full fat milk used on scale **A**.
2. Find the targeted water content % for the cheese being ripened on scale **C** and read off from scale **D** how many kilograms of cheese every 100 litres of cheese milk should optimally yield.

[3] If cut up too small the excess shavings run off with the whey and is detrimental to the yield.

*For example, the optimal yield when making a **low fat** (+30 or 30% butterfat cheese curd) **semi-hard** cheese (50% water content) from **full fat milk** with 3.65% butterfat would be **9.5 kilograms of cheese for every 100 litres of cheese milk**.*

Worked example showing the 4 line-up points

The calculation could also work in reverse if a cheese maker had limited space left in the storage/maturing area for a new batch of cheese truckles. Starting with the amount of free space left expressed in Kg's of cheese (i.e. space left for n truckles cheese x average weight in Kg per truckle) reverse calculate for a chosen type of cheese (fat content and hardness) the maximum litres of cheese milk that should go into the next batch of cheese production.

Epilogue

Try out an online simulation of *Von Henning*'s impressively simple to use slide rule for cheese making at: http://rekeninstrumenten.nl/im2019/shiftImg.html?rule=kaas .

Today a simple applet on a smartphone could do the same calculation more accurately and quicker. Nevertheless and ironically *Von Henning's* slide rule would be just a useful today as it was in its heyday. This is because the modern-day cheese industry, as in *Von Henning's* day, is still striving for standardisation of production and the optimal yield [5] from cheese making.

Acknowledgments and References

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1. **Eurostat**: a website maintained by the European Commission to enhance public access to information about its initiatives and European Union policies in general - https://ec.europa.eu/eurostat/web/main/home .
2. **Genealogieonline**: Dutch website for searching ancestors and publishing family trees - https://www.genealogieonline.nl/stamboom-haeck/I749.php .
3. **Griede and Zoet**: "*Wezep door de jaren heen*", ISBN no.: 9789461902849, private publication, 2nd edition, 2012.
4. **DairyTechnologist**: a specialist website for the dairy industry https://dairytechnologist.com/types-of-cheese/ .
5. **De Snijder, Giedo**: private correspondence, July 2019.