Total FAT Quantitation using a new Microwave Assisted Extraction Workflow

FAST FAT PROJECT

FAsT
Fast Fat Analysis

Program

- Introduction
- Total Fat Arbitration Methods
- Microwave M.A.E
- Advantages
- Figures of Merit

UNICAM

Sistemas Analíticos, Lda.

- **History of more than 100 years in Analytical Chemistry**

www.thermounicam.pt

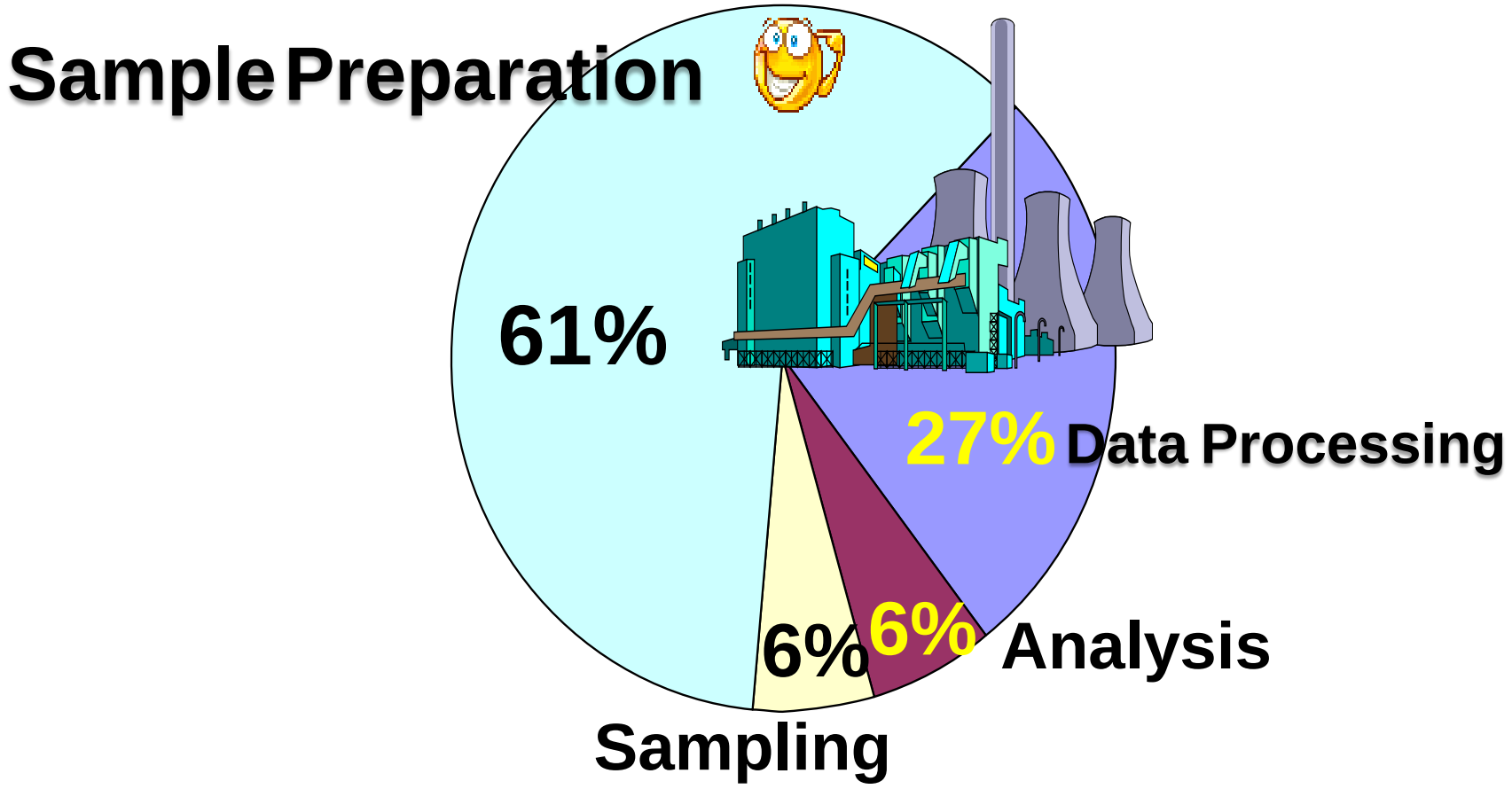
thermo scientific

Authorised Distributor

MILESTONE

HELPING CHEMISTS

The Lab : Time is money



From: Ronald Majors “Overview on sample prep.” LG_GC. VOL. 9 . 1991

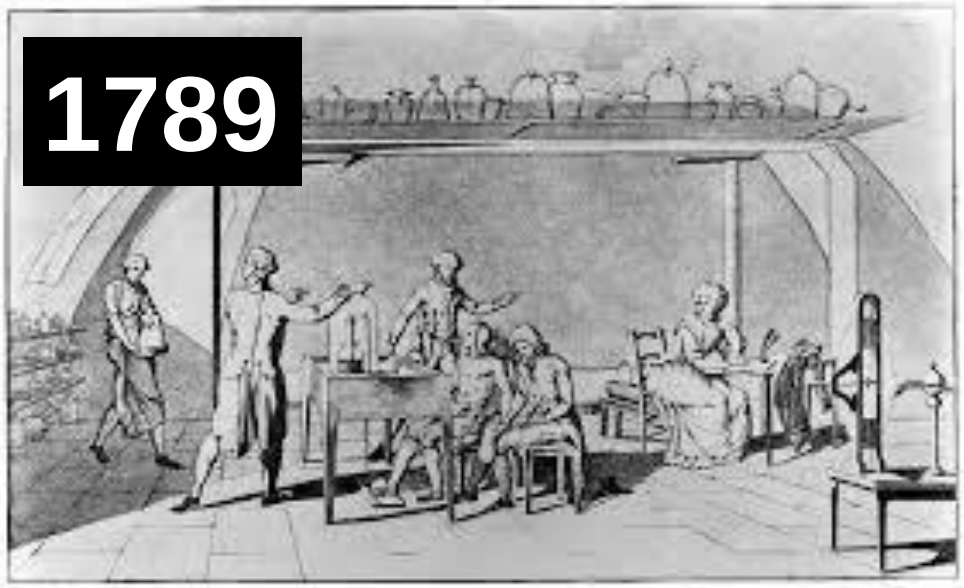
The Modern Lab

- HPLC – HPLCMS – ICP- GCMS
- Modern technologies in ANALYSIS

1.5M€

Sample Preparation

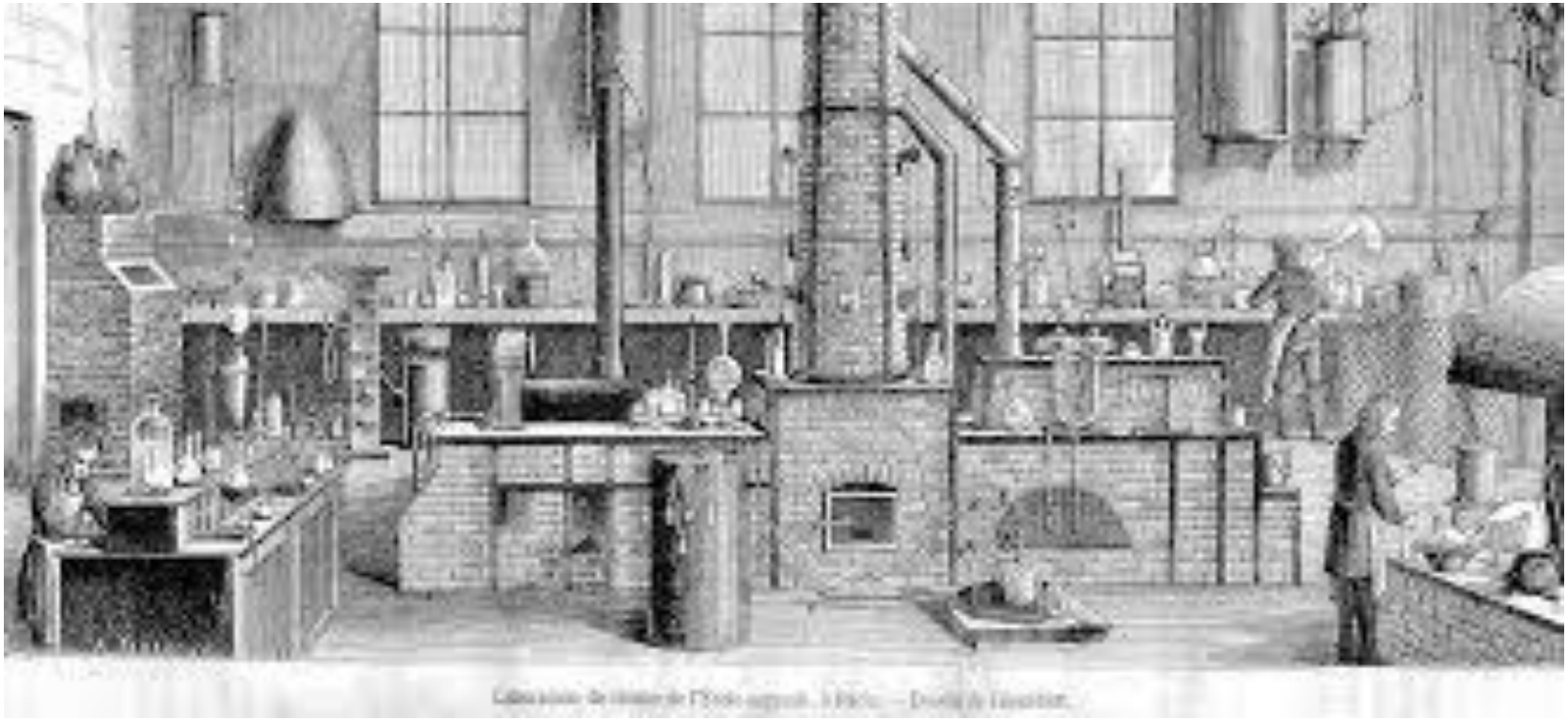
Lavoisier : law of conservation of mass

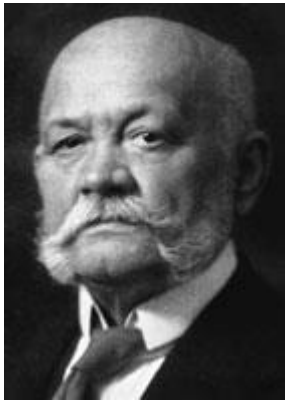


- Ovens, Heating baths, …

150 years ago Mendeleev

- Ovens, Heating baths, …





Soxhlet

German agricultural chemist Franz Ritter von Soxhlet first introduced its Soxhlet laboratory extractor in 1879 which deals in the determination of milk fat.

Standard Methods for Total Fat

Arbitration method

gravimetric test

- ***„Weibull-Stoldt“*** (universal method)
- „Schmidt-Bondzynski“ (cheese)
- „Röse-Gottlieb“ (milk, cream)
- *normal cheese must be analysed accord. to „Schmidt-Bondzynski“*
- *cheese with herbs/pepper must be analysed accord. to „Weibull-Stoldt“*
- *AOAC Methods – NP similar to W-S and are the common reference*

Other fast-method

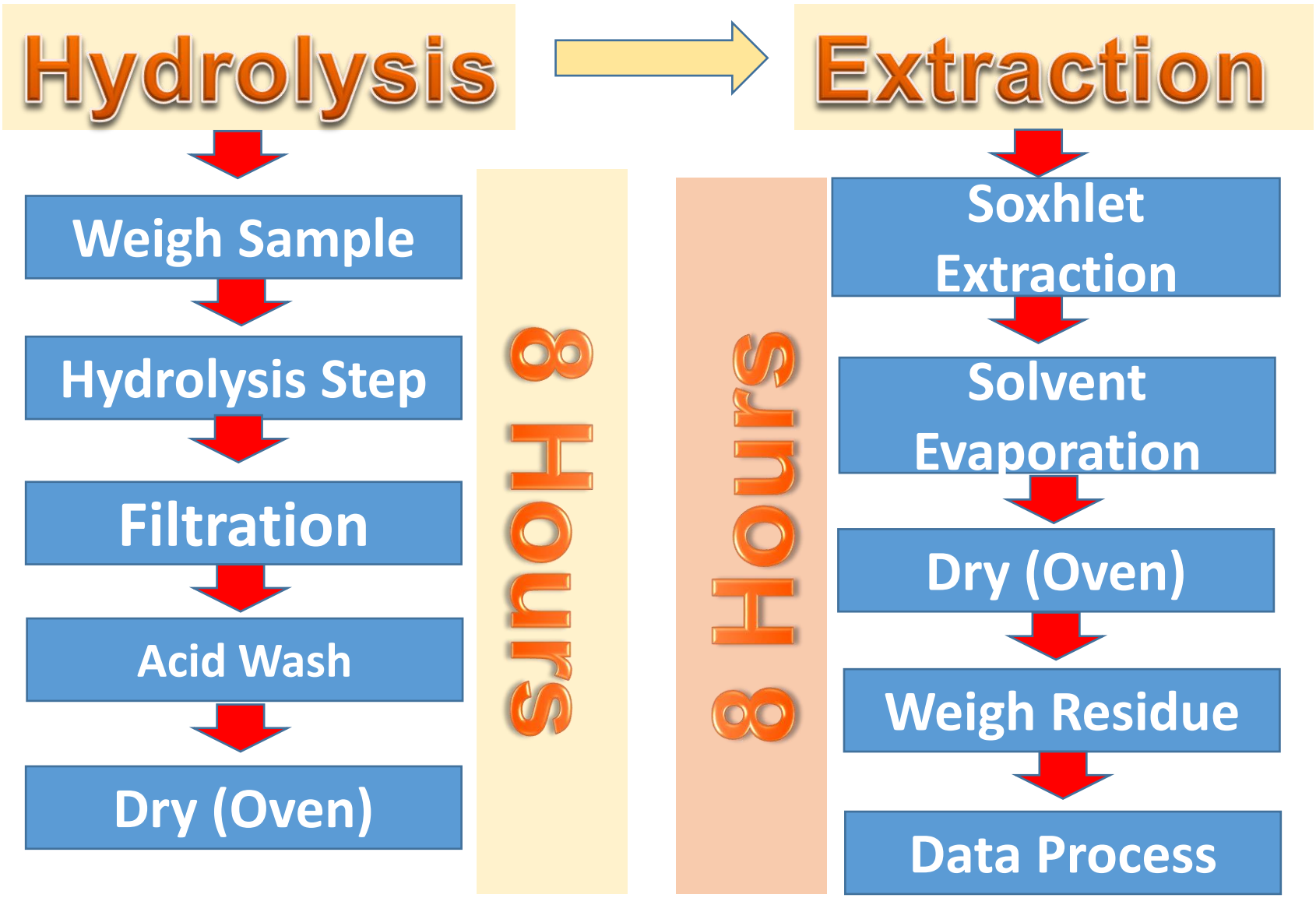
butyrometric test,

or volumetric determination

- for milk: „*Gerber*“
- for cheese „*Gulik*“
- for cream: „*Roeder*“
- for skim milk: „*Konrad*“
- *NIR/NMR*

depending on user performance, not very precise

Weibull-Stoldt Method Workflow



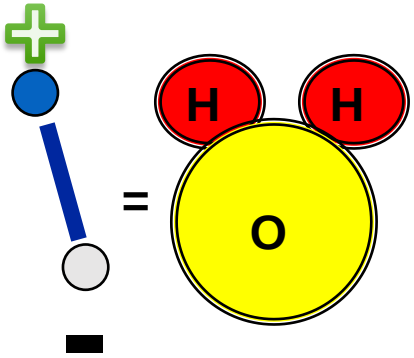
The Problem

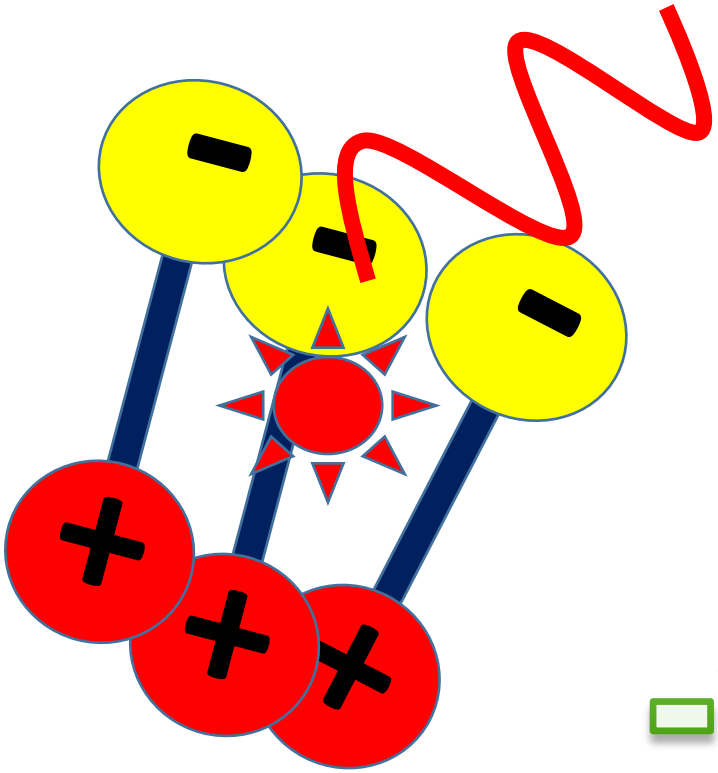
- Total Fat is a mandatory analysis used for Food/Feed labelling
- It takes 2 days to get to results
- Solvent Waste

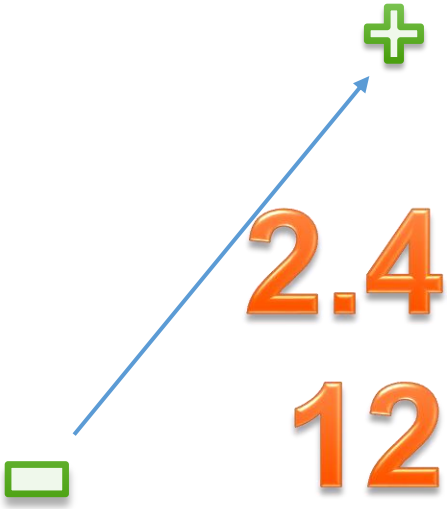
Can we make it faster?
And Greener?

MW HEATING

Can we use Microwaves?







2.45GHz

12.2cm

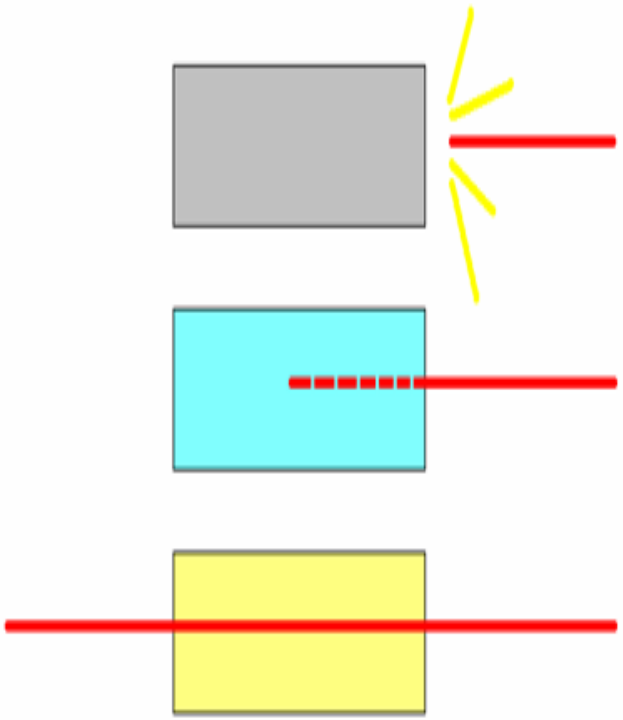
ROTAÇÃO DIPOLAR E MIGRAÇÃO IÓNICA

Can we use MW M. A.E for TOTAL FAT Extraction ?

- The solvent of extraction is super-heated by microwave (above boiling point)
- Extractions Kinetics

$$k = Ae^{-\left(\frac{Ea}{RT}\right)}$$

Microwaves and Heating

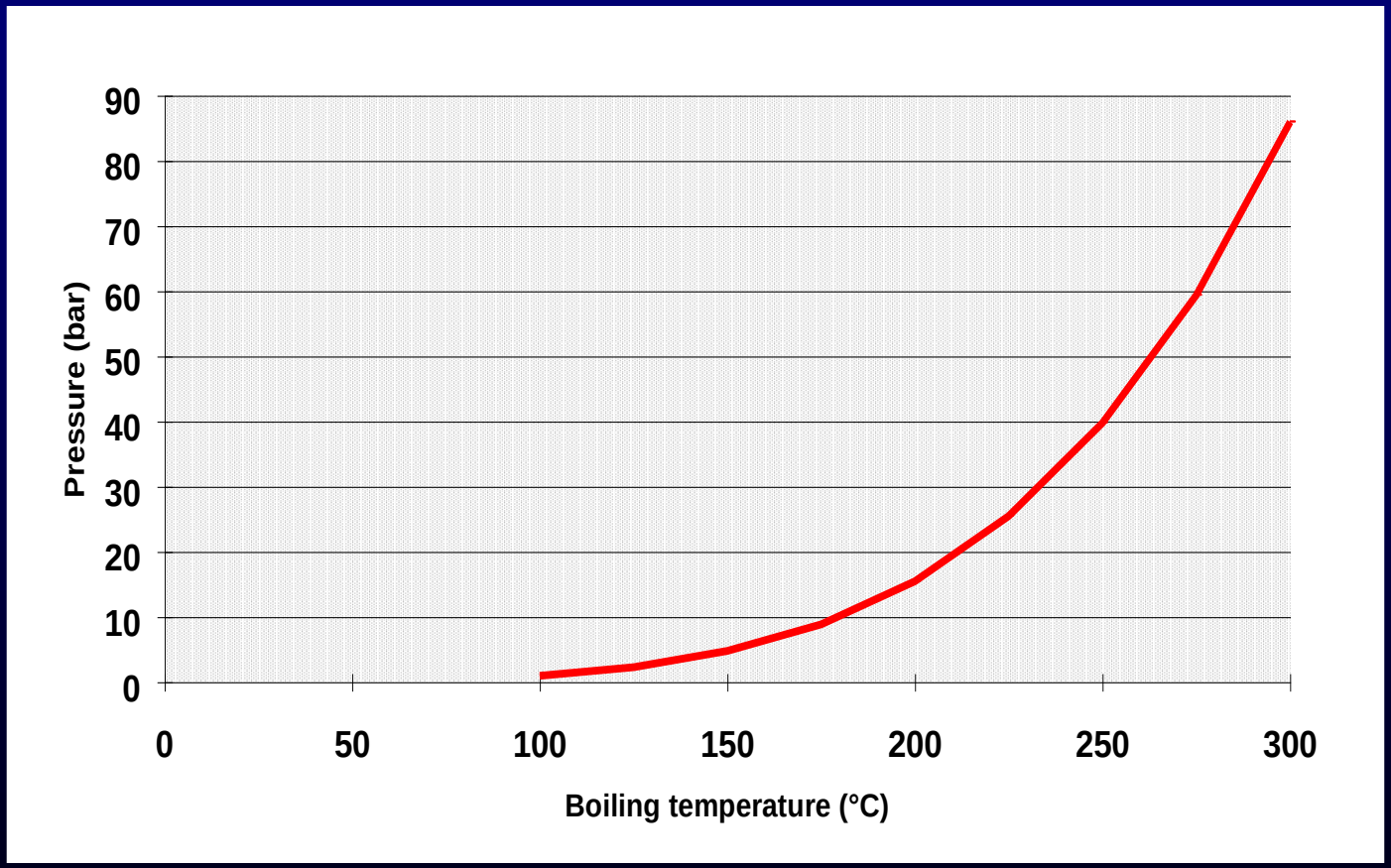


- The material can be :
  - Reflective (metals)
  - Absorbent (Water)
  - Transparent (Hexane)

Microwaves in the Lab

- CLOSED VESSEL Sample Digestion
- CLOSED VESSEL Sample Hydrolisis
- CLOSED VESSEL Extraction with Organic solvents and stirring

BOILING TEMPERATURE OF WATER vs. PRESSURE VAPOUR

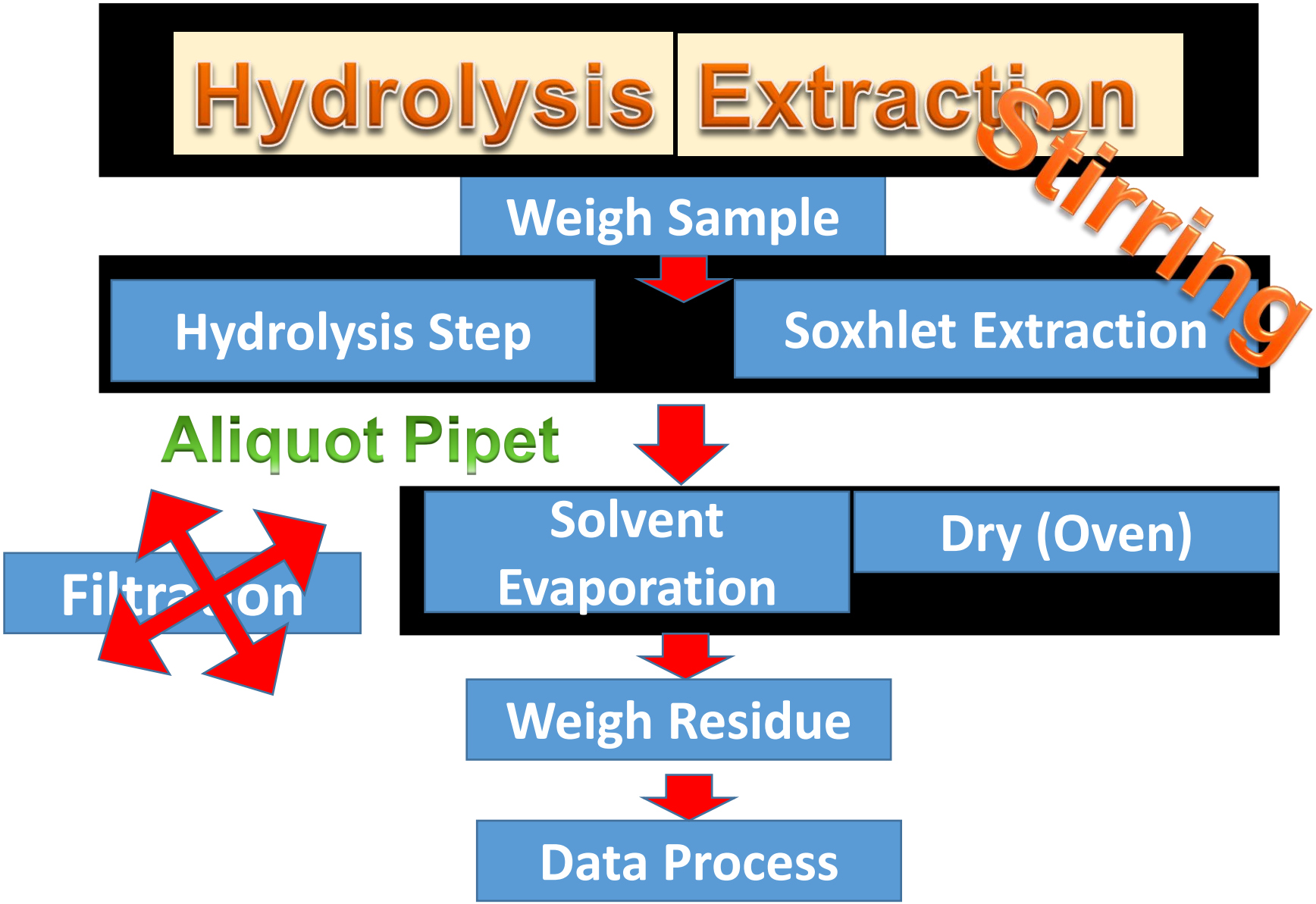


MILESTONE
Microwave
LABORATORY SYSTEMS

Total Fat Determination

- ***Hypothesis: A fast and precise method for food and feed samples***

Proposed MAE Method Workflow



Advantages

One Method for all

Hardware 12 Samples

ETHOS X

Traditional

Hardware Costs

M.A.E

3 Hs

Productivity

16 hs – 2 Days

Traditional

M.A.E

Solvent

Green Chemistry

Solvent expense

Traditional

Proposed Hardware for Total Fat

Professional MW

Balance

12 Position

Evaporation

* Vacuum pump with pressure condensation for improved solvent recovery

FAsT
Fast Fat Analysis

Figures of Merit

Comparison of a New Total Fat Quantification Method in Cheese using Microwave Assisted Extraction (MAE) and Soxhlet

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Conclusion:

M.A.E proved to be easier, simpler and equivalent to Soxhlet Methods for Cheese samples

Already tested and future

- 12 Samples in the same instrument
- Or …different samples in same run
  - Meat
  - Sausages
  - Yogurth (High and low fat)
  - Milk
  - Cheese

Acknowledgements

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