SEAL Analytical

CONTINUOUS-FLOW ANALYZERS

HIGH PERFORMANCE - AUTOMATIC OPERATION

CONTINUOUS-FLOW ANALYZERS

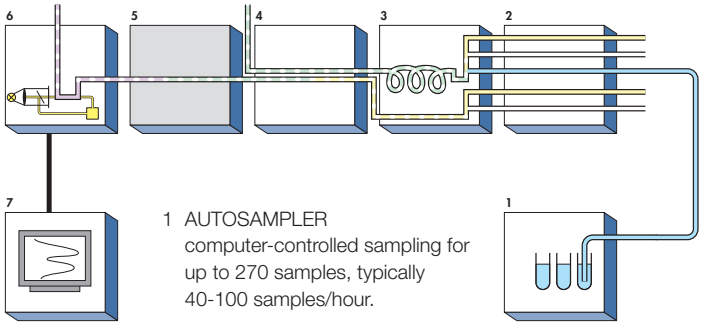
FLEXIBLE, PRECISE AUTOMATION FOR LABORATORIES OF ALL SIZES

CFA ANALYSIS

Thanks to their flexibility and high performance, AutoAnalyzer and QUAATRO Continuous-Flow Analysis (CFA) systems are used world-wide for rapid, reliable analysis. More than 11,000 systems have been installed.

They are flexible: models are available for labs with a small number of samples requiring the same analysis and also for large laboratories with hundreds of samples per day, measuring several different parameters in each sample at the same time. They use the Segmented-Flow Analysis principle to achieve complete reaction, high reproducibility and low detection limits.

PRINCIPLE OF OPERATION



1 AUTOSAMPLER
computer-controlled sampling for up to 270 samples, typically 40-100 samples/hour.

2 PUMP
reagents and sample are pumped at specific flow rates.

3 MIXING COIL
air is introduced, reagents and sample are mixed.

4 DIALYZER
the substance being measured diffuses through the membrane, interfering material is left behind.

5 HEATING BATH
for chemical reactions needing a high temperature. Reactiontime up to 20 minutes.

6 PHOTOMETER
measures the light absorbance at a specific wavelength. A flame photometer can also be used.

7 PC-BASED DATA HANDLER
calculates, reports and stores the results.

AUTOANALYZER 3

Lowest detection limit and widest range of applications.

QUAATRO

Up to 120 samples per hour, with innovative automation before, during and after the analysis.

ECOANALYZER

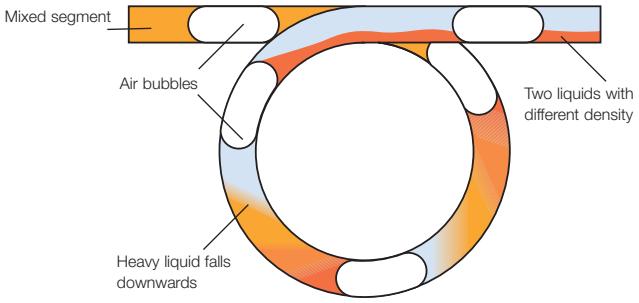
Economical system with the advantages of segmented-flow analysis at an economical price

ADVANTAGES

- Low reagent consumption: typically 0.5 - 2 mL per analysis
- High reproducibility: relative standard deviation typically 0.2 - 0.5 %
- Ultra-low detection limits, for example 20 ng/l for nitrite-N on the AutoAnalyzer 3
- Methods approved by ISO, EPA, AOAC, and DIN
- Chemical reactions up to 20 min. proceed to completion, so small variations in reaction time and temperature do not affect the accuracy of results.

MIXING AND REACTION

Sample and reagent are mixed in each liquid segment as it flows through a glass coil. If a delay is necessary to allow a reaction to go to completion, this is easily arranged by passing the stream through a longer delay coil for up to 20 minutes. The stream can be heated to up to 95 °C to accelerate reactions. Several reagents can be added at different stages of the reaction.



Mixing is assisted by gravity and the internal flow within each segment

CONTINUOUS DISTILLATION

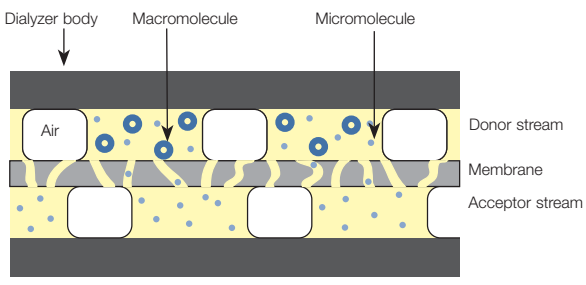
This time-consuming procedure is automated quickly and safely with CFA. The sample is pumped into a coil in a 150°C heating bath. An involatile liquid such as H_2SO_4 added before distillation prevents solids from building up in the distillation coil. The sample boils in a few seconds, and the resulting vapour passes into a separating column and then into a condenser. The purified sample stream is then pumped into the analytical manifold. Distillation is used to separate interfering material before the analysis of phenol, cyanide and fluoride in water and for the analysis of some alcoholic drinks.

ON-LINE DIGESTION

A long quartz coil is wrapped around a UV lamp, so that the sample is irradiated for up to 8 minutes. Depending on the type of lamp and the coil material, which can be selected so as to pass different wavelengths, it is possible to break down complex molecules completely, as in the determination of total N, P or C, or partially as in the analysis of complex cyanides which are broken down to HCN.

DIALYSIS

Dialysis cleans up dirty samples such as waste water, and removes interfering substances like fat, protein or large coloured compounds. Ions and molecules with a molecular weight under about 1000 diffuse through the membrane: larger molecules remain in the donor stream and go to waste. Special membranes made of PTFE or silicone rubber allow dissolved gases such as CO_2, NH_3, HCN and SO_2 to pass through but do not pass liquids or dissolved solids.



Principle of dialysis

SOLVENT EXTRACTION

When two immiscible fluids such as water and hexane are pumped into a CFA manifold, they form alternate segments analogous to the liquid/air segments in a normal method. The movement within each segment as it flows through the tubing results in efficient counter-current extraction at the phase interface, so that equilibrium is reached within a short time. The phases are then sepa-rated by density.

An application of continuous extraction is the determination of anionic surfactants in water, in which methylene blue ion-pairs are extracted into chloroform. Because a CFA manifold is a closed system, solvent vapour is not released into the atmosphere during extraction.

PARAMETERS

	Drinking water	Surface water	Seawater	Waste water	Swimming pool water	Soil extracts	Air	Boiler water	Metallurgical processes	Fermentation	Pharmaceutical production	Chemical production	Milk	Meat	Wine and fruit juices	Beer	Tobacco
Aldehyde							●								●		
Aluminium	●	●				●			●								
Amino acids											●			●		●	
Ammonia	●	●	●	●	●	●	●			●							●
Ascorbic acid											●		●		●		
Bitterness																●	
Boron						●											
Calcium	●	●										●	●	●			
Chloride	●	●		●	●									●			●
Chlorine (free)					●		●					●					
Chlorite												●					
Chromate				●													
CO_2			●									●			●		
Copper			●	●													
COD		●		●													
Cyanide		●		●													
DOC		●	●	●													
Fluorine		●		●													
Fructose										●					●		
Glucose										●					●		
Glutamic acid										●					●		
Glycerine															●		
Hydrazine								●									
Hydroxyproline														●			
Iron	●			●											●		
Lactic acid															●		
Lactose										●			●				
Lipase											●						
Lead (organic)				●													
Lysine										●	●						
Magnesium	●	●				●						●					
Manganese	●	●		●		●			●								
Nickel				●					●								
Nicotine																	●
Nitrate	●	●	●	●	●	●							●	●	●		●
Nitrite	●	●	●	●		●							●	●			
Nitrogen (total)						●											
Phosphate (ortho)	●	●	●	●		●			●					●	●		
Phosphorus (total)	●	●															
Pyruvate												●					
Silicate		●	●					●	●								
SO_2															●	●	
Sugars										●	●				●		
Sulphate	●	●		●		●											
Tin				●					●								
Urea			●									●	●				
Vanadium				●					●								
Zinc				●					●								

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