The rapid gauging by the tracer dilution method

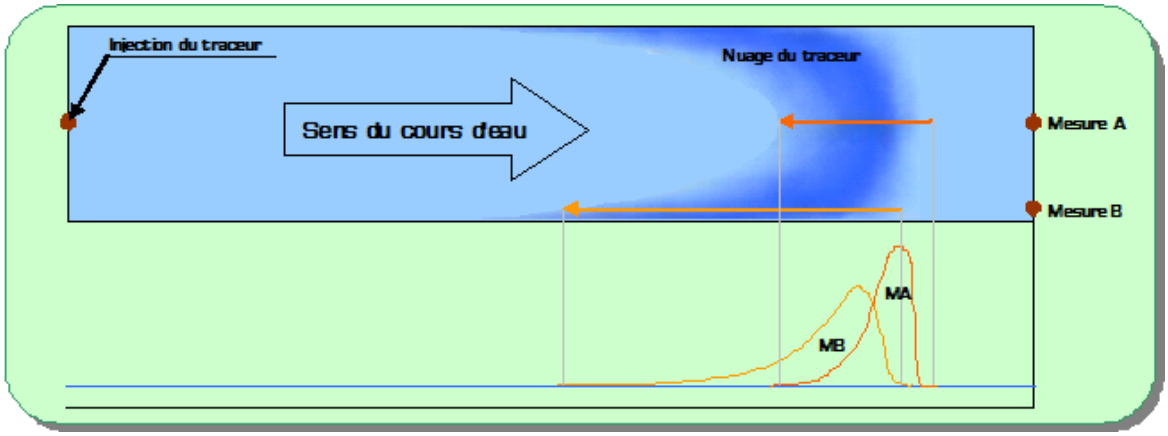
The tracer dilution method measures stream flow on the basis of the rate of dispersal of an introduced tracer, with the concentration of the tracer monitored downstream.

The method involves introducing a tracer known volume and concentration into the stream in a single slug. The concentration of the tracer and the time of measurement is monitored at a downstream location. The distance between the injection point and the measurement point should be long enough to ensure a good mix of the tracer in water.

The following conditions are necessary to use this method:

- The stream flow has to stay constant during the measurement ;
- The tracer has to pass totally by the measurement point ;
- At the measurement point, the mixture should be such that the same tracer quantity passes by each point on the river section.

According to the above conditions, this method applies particularly to streams with highly turbulent flow conditions, like rivers or torrent. However, it is not appropriate for flow measurements in canals where no obstacle does water brewing.



Cooking salt as tracer

Cooking salt, sodium chloride (NaCl), is a perfect tracer: it possesses a high degree of dilution in water, it is non-polluting and very few absorbed by vegetation and materials present in the stream bed and it is inexpensive. And last but not least, its concentration can be easily measured by a conductivity probe.

In this case, a known salt mass *M* is injected into the stream in a single slug. Downstream, a conductivity probe measures the water electrical conductivity throughout the duration *T* of passage of the salt cloud. A linear relationship exists between the water conductivity and the dissolved salt concentration. The resulting concentration hydrograph *C(t)* maps the dispersed passage of the tracer slug at the measurement point. The stream flow Q is then calculated by integration:

$$Q = \frac{M}{\int_0^T (C_t - C_0)\, dt}$$

Q : Stream flow [l/s]
M : Injected tracer mass [mg]
C_t : Water salinity at time t [mg/l]
C_0 : Basis water salinity [mg/l]
T : Measurement duration [s]

Our devices

Our both flow measurement devices **SALINOMADD** and **EASYFLOW** use this method with cooking salt as tracer.

The equipment **SALINOMADD** is destined to professionals in hydrology who frequently do flow gauging and sometimes under difficult conditions. It permits to introduce many parameters about the site, like the name of the stream, the atmospheric conditions, the limnimetric height, etc.

Simplified version of the **SalinoMADD**, the **EasyFlow** is more adapted for professionals who occasionally do flow gauging and who don't need to record several measuring sites.

Comparative table

Device	SalinoMADD	EasyFlow
Number of gauging measurements	15 sites	1 site
Pre-programming of sites	Yes	No
Quantity of injected salt	1 to 9999 g 1 to 9999 kg	10, 20, 50, 100, 200, 500 g 1, 2, 5, 10, 20, 50, 100 kg
Measuring interval	1, 2, 4, 8, 16 or 32 s	1, 2, 4 or 8 s
Measuring range	0 to 2000 mg/l	0 to 3200 mg/l
Salinity sensitivity	1 mg/l	1 mg/l
Salinity precision	± 1 % max.	± 1 % max.
Temperature precision	± 0,2 °C	± 0,2 °C
Length of the probe cable	10 meters	10 meters
Measurements in multimeter mode	Temperature, salinity and conductivity	Temperature and salinity
Supply	4 x 1,5 V alkaline batteries LR6	4 x 1,5 V alkaline batteries LR6
Battery life	> 30 hours	> 100 hours
Packaging	Suitcase	Saddlebag
Weight (device and probe)	1,6 kg	720 g
Total weight (with case or bag)	2,7 kg	1,3 kg
Accessories delivered with device	5 calibration doses beaker of 0,6 l test tube of 100 ml	3 calibration doses
Software on PC delivered with device	SalinoMADD	EasyViewer
Adjunction of indications	On device and on PC	On PC
Modifiable parameters on PC	Yes	Yes

MADD TECHNOLOGIES can change these specifications without warning

MADD TECHNOLOGIES SÀRL – Avenue des Sports 42 – CH-1400 Yverdon-les-Bains – Switzerland
Tel: +41 24 445 31 16 – Fax: +41 24 445 21 23 – Email: info@madd.ch – www.madd.ch