

# All Leak Detection Tasks only with one Device

## The W.A.S. Waterloss Analysis System & Correlator

**The W.A.S. is a device for nearly all purposes of leak detection:**

- Control of water losses
- Pre detection with listening rod
- Pre detection with zero measurement
- Pre detection with pressure measurements
- Pinpointing with ground microphone
- Pinpointing with correlator
- Pipe Locator for all pipe materials

Presented by Jürgen Franz

owner of FWT Franz Water Technology GmbH, Würzburg, Germany



## Origin of water losses

Water Leaks on drinking water pipes do seldom occur suddenly, they develop over a period of time.

Picture 1 shows a leak at a metal pipe. One can tell by its size that the leak must have existed for a longer period of time already.



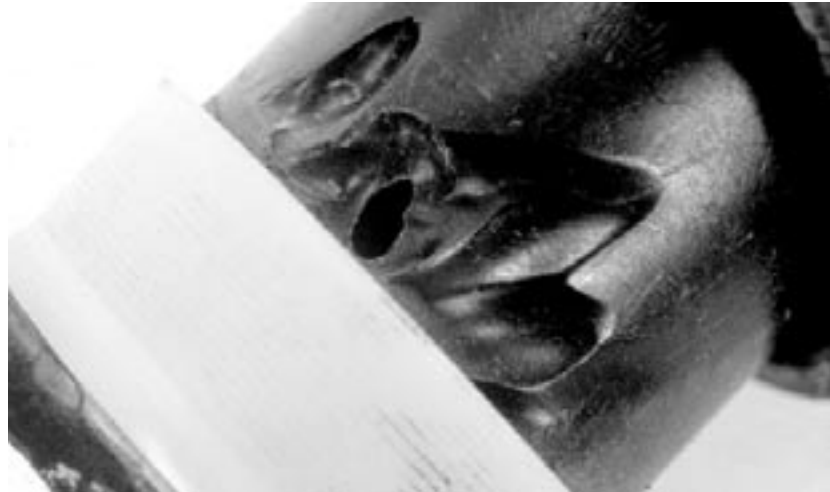
**Picture 1: big leak**

Picture 2 also shows a metal pipe, but in this case the leakage was caused by corrosion from the outside. These leaks have existed for a longer period of time; if nobody had detected them, more leaks in ambient areas would have developed.



**Picture 2: leaks caused by corrosion from the outside**

Picture 3 shows a leak at the mounting of a service line made of plastic material. Here too, the flushing outs around the outlet show that these leaks have existed for a longer period of time.

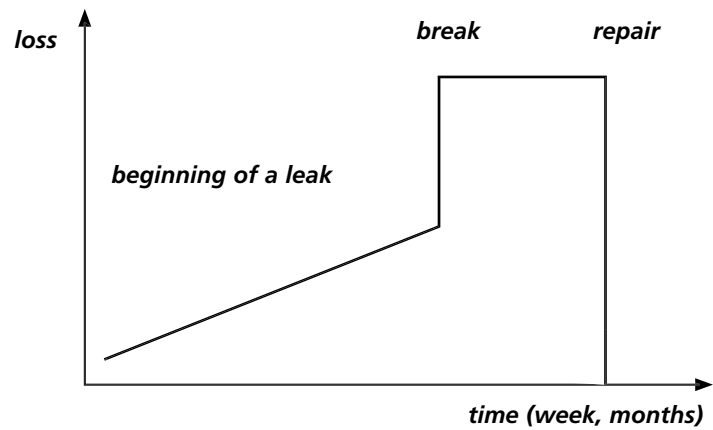


**Picture 3:**  
*leak at a mounting*



**Picture 4:**  
*longitudinal tear in PVC-pipe*

One can see clearly that these leaks did not develop suddenly but have been leaking for some time already. Leaks usually start out as tiny little leakages, caused by corrosion or a tear in a plastic pipe (picture 4). Then these leakages slowly become bigger and bigger, then they are detected sometime and repaired. Should such leaks not be detected, the pressure thrusts constantly present in the network can cause a breakage and a sudden enlargement of the outlet (picture 4). Thus emerges a very important finding on water supplies:



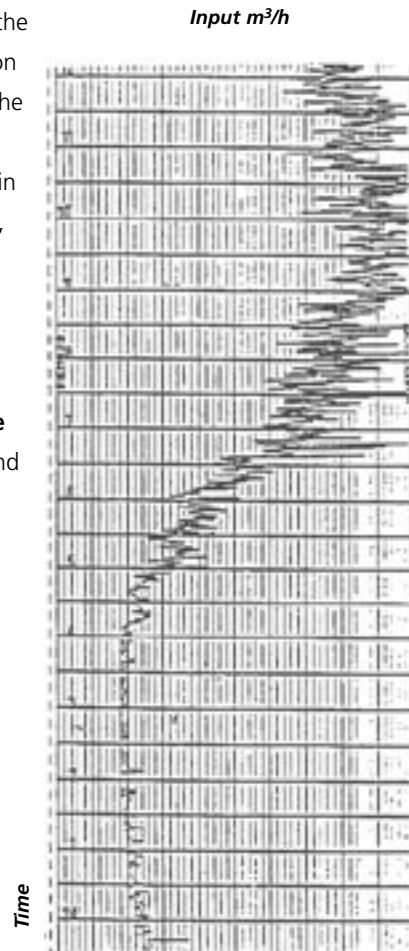
**Picture 5:**  
**typical time frame**  
**for the develop-**  
**ment of a leak**

The extent of water losses depends on the duration of each individual leak. That is the period of time between the first time the leakage occurs and its detection and repair. If it were possible to detect and repair all leaks immediately, the loss quota would be practically zero. The examination of a bigger water supplier showed that each leak leaks for about 50 days from its development on until it is localized and repaired. From this finding, one can conclude any measures to be taken by a water supplier in order to control his water distribution network in view of leaks. One has to try to detect and repair every leak early.

## Determination of water losses

A widely used procedure to determine the "momentary losses" is the determination of the smallest night inflow. Based on the assumption that there is no water consumption at a certain time at night in a dense pipe network or a part of that, one can find out the smallest night inflow by constantly measuring the inflow to this network (picture 6).

You can **record such a curve with the W.A.S. Waterloss Analysis System** and here you will see the first task that this device can do.



**Picture 6:**  
*Inflow into a water supply*

## Determination of leaks

With the **listening rod, attached to the W.A.S.** you can hear at hydrants, valves or other points of the pipe network, whether there is a noise that is louder than the environment (picture 7). This might be a leak.



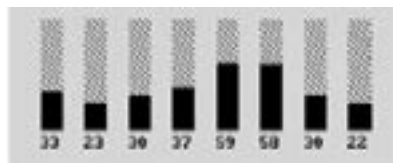
**Picture 7:**  
*Points testing with listening rod at the W.A.S.*

If it is, you have to determine where the leak exactly is ("pinpointing") and where you have to excavate. For this purpose you use the **ground microphone, it is also adaptable to the W.A.S.** (picture 8 and 9).



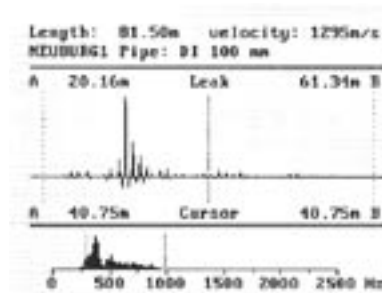
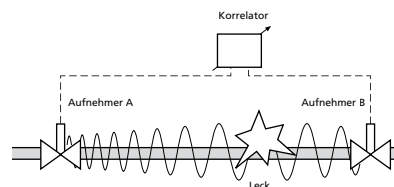
Picture 8: Ground microphone, connected with the W.A.S.

Picture 9: Ground microphone – sound optimum, shown at the display of the W.A.S.



Another method of **pinpointing leaks with the W.A.S. is the correlator method.** The noise that a leak produces will be taken at 2 points of the pipe (f.i. at hydrants or valves) and will be sent to a computer (the correlator) that counts the exact location of the leak (pictures 10 and 11)

Picture 10: Working with the correlator



Picture 11: The correlator at the W.A.S. has pinpointed a leak at 20,16 m from point A

Sound transmission is weak in plastic pipes so that the "listening methods" described above might be ineffective. Furthermore, there are leaks that cause no or only a weak noise and these leaks are, tragically, exactly the bigger leaks, where the amount of leaking water is so big that the pressure has decreased so much that almost no noise is caused. In those cases you have to isolate the leak with the method of **zero consumption measurement.**

In this procedure, a specific section in a network (not more than 2-5 km) is separated from the network by closing the gate valves. The input to this separated network section is made through a fire hose, whereby water is put out from the other network section (Picture 12).

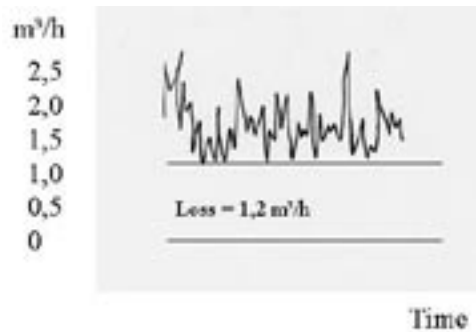
**Picture 12:**  
Zero Consumption  
Measurement  
– Installation



**Picture 13:**  
Zero Consumption  
Measurement,  
measuring of flow  
and pressure



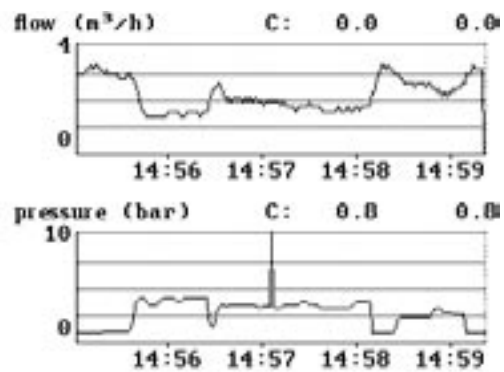
The inflowing water is measured by a special case (option) and **shown and recorded by the W.A.S.** (Picture 13).



**Picture 14:**  
Protocol of a zero  
consumption  
measurement with  
the W.A.S.

Picture 14 shows the inflowing water quantity. One can recognize the different variations in consumption and further recognizes that the minimum inlet, again and again, does not go below a certain value. In this case, one can assume there is a leak in this separated network section. In order to limit the area further, the separated network section is sized-down until one has singled out the pipe string with the leak. For further pinpointing the procedures as described above are used.

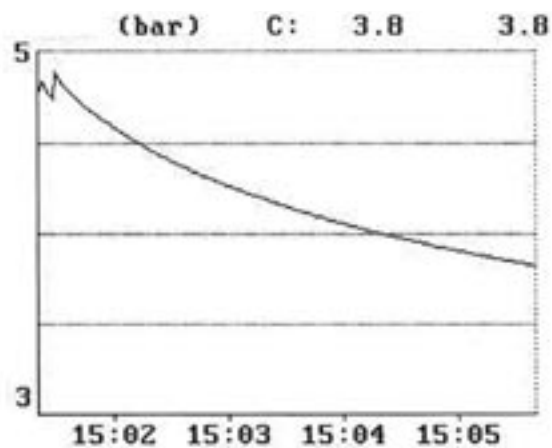
You have to also measure the pressure, to ensure that the closed valves are tight. If you lower the pressure in the "cut off" pipe section, not totally closed valves will begin to make a noise. But lowering the pressure in a drinking water pipe system is not undangerous and must be done and checked carefully. So you will also see and record the pressure at the W.A.S.(Picture 15)



**Picture 15:**  
Flow and pressure  
measuring together

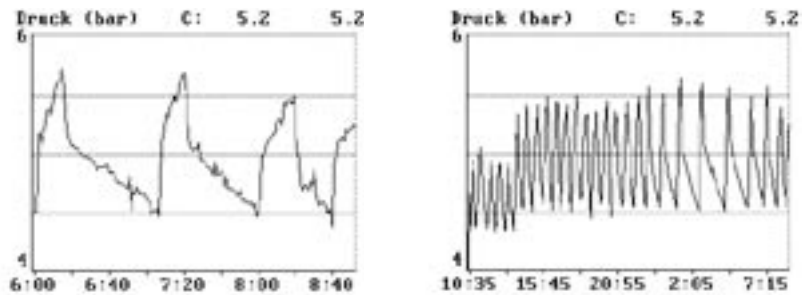
But the W.A.S. will do more:

You can make a **pressure test with recording** at a pipe. In picture 16 you can see that this pipe is not tight because the pressure is declining.



**Picture 16:**  
Pressure test with  
the W.A.S.

Figure 17 shows a recording of the pressure behind a booster station. You can see the highering of the pressure during the working of the pumps and the decreasing following the pumps stop. In a recording over days you can also see that the booster station is working less during the night.



**Picture 17:**  
*Pressure recording with the W.A.S. behind a booster station*

In some leak detection cases you have to locate the pipe. For metallic pipes you are accustomed to use a magnetic or a inductive pipe locator. This is not applicable for plastic pipes because plastic is not magnetizable.



**Picture 18:**  
*Sound Generator for pipe location*

For all pipes you can use a sound generator (Picture 18). With this device you generate a sound of various strength into the water (via a hydrant) and you follow the noise with the ground microphone at the WAS for some hundred meters.

**Thus the W.A.S. is a device for nearly all purposes of leak detection:**

- Control of water losses
- Pre detection with listening rod
- Pre detection with zero measurement
- Pre detection with pressure measurements
- Pinpointing with ground microphone
- Pinpointing with correlator
- Pipe Locator for all pipe materials

All measurements are transferable to a PC and you can send them by E-mail to where ever you want. In return all program improvements can be sent to you via E-mail to input them directly into the device.

**The W.A.S. is available as:**

**Version ECO:** for listening stick, ground microphone and as correlator  
(the smallest, easiest and cheapest correlator of the world)

**Version COMBI:** for all purposes

Version ECO is extensible to Version COMBI

---

Contact: Jürgen Franz, Finkenweg 27, D 97082 Würzburg, Germany

Phone : ++49 931 417640

Fax : ++49 931 417642

E-mail : [fwt@frawatec.com](mailto:fwt@frawatec.com)

Web : [www.franzwassertechnik.com](http://www.franzwassertechnik.com)