



DRIVETEC divisione AULOS
Al servizio della risorsa acqua
At disposal of the water resource

Water leakage localization using ENIGMA PRIMAYER hydrophones

Commissioner	: MEDITERRANEA DELLE ACQUE S.p.a.
Network manager	: NUOVE ACQUE S.p.a. – AREZZO (ITALY – Tuscany Region)
Technician forces	: DRIVETEC , AULOS division
Operating modalities	: Night Step-Test operations + hydrophones PRIMAYER (Mod.ENIGMA)
Intervention date	: 2008, APRIL 8th

Arezzo hydric network – District : CARABINIERI

Premises

CARABINIERI district lays on a wide residential area of the hydric network of Arezzo (Tuscany region - ITALY), managed by Società NUOVE ACQUE S.p.a. The water distribution system is characterized by a grid network hydraulically interconnected to the main backbone of Via Fiorentina. The operating program of the water leakage search has been realized by means of Step-Test operations during the night on predefined areas of the network (time-slot between 01,00 and 05,00 o'clock) and using PRIMAYER hydrophones (ENIGMA system) for the correlations. The precise localization of the leakages resulted particularly critique due to the high "environmental acoustic noise pollution" created by the intensive urban traffic of Via Fiorentina and moreover due to the particular position of the pipe, placed underground for long portions inside private properties and covered by vegetal ground, with the consequent great difficulties to operate with geophone and/or with the classic correlator (due to the shortage of access points to the piping).

Operating conditions

In tight cooperation with the Technical Direction of Società NUOVE ACQUE we have realized some direct junctions on the main pipe of Via Fiorentina with derived taps of ½inch. female, housed inside small underground street rooms. Over the taps we installed the PRIMAYER hydrophones. The distances of the correlated sections varied from 600,0 ÷ 800,0 m. covering the whole length of the piping between the derivations of the Via Perugia and San Leo. The hydraulic load available on the network oscillated between minimum daily values of about 3,7 bar to maximum values of 4,5 bar.

Campaign of leakage search with PRIMAYER hydrophones - April 2008

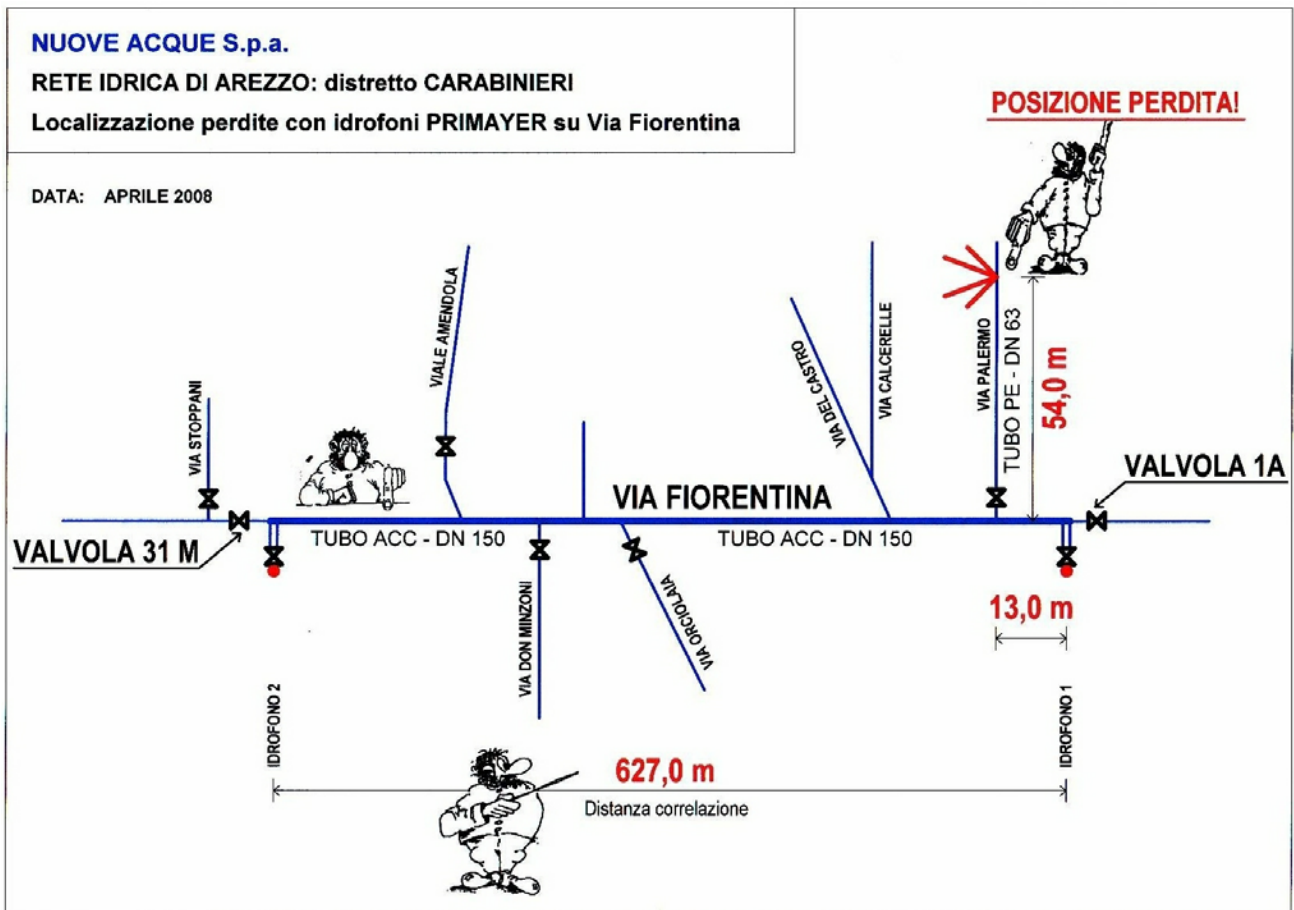
During the leakage-search campaign of April 2008 , we carried out a verification with hydrophone of PRIMAYER on the whole backbone of Via Fiorentina. The single correlations with hydrophones have been programmed for the night of Tuesday April 8th due to the needs of both minimum environmental acoustic noise and the highest hydraulic load on the network. The accurate analysis of "Coherence" function allowed us to find a huge leakage, estimated in about 4,5 l/s, on a line derived from the main pipe DN150 of Via Fiorentina , as shown in the enclosed drawing.



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Linear correlation distance	:	627,0 m
Correlated piping	:	STEEL - DN 150 mm
Intervention date	:	2008 , night of Tuesday April 8th
Operating conditions	:	Low acoustic noise pollution
Available hydraulic load	:	Max. 4,5 bar - Min. 4,2 bar
Elaboration of Coherence parameter	:	29 Hz ÷ 88 Hz
Delay time found	:	500,4 ms (milliseconds)
Leakage position	:	Via Palermo on a PE pipe derivation
Leakage distance from DN 150 line	:	About 54,0 m



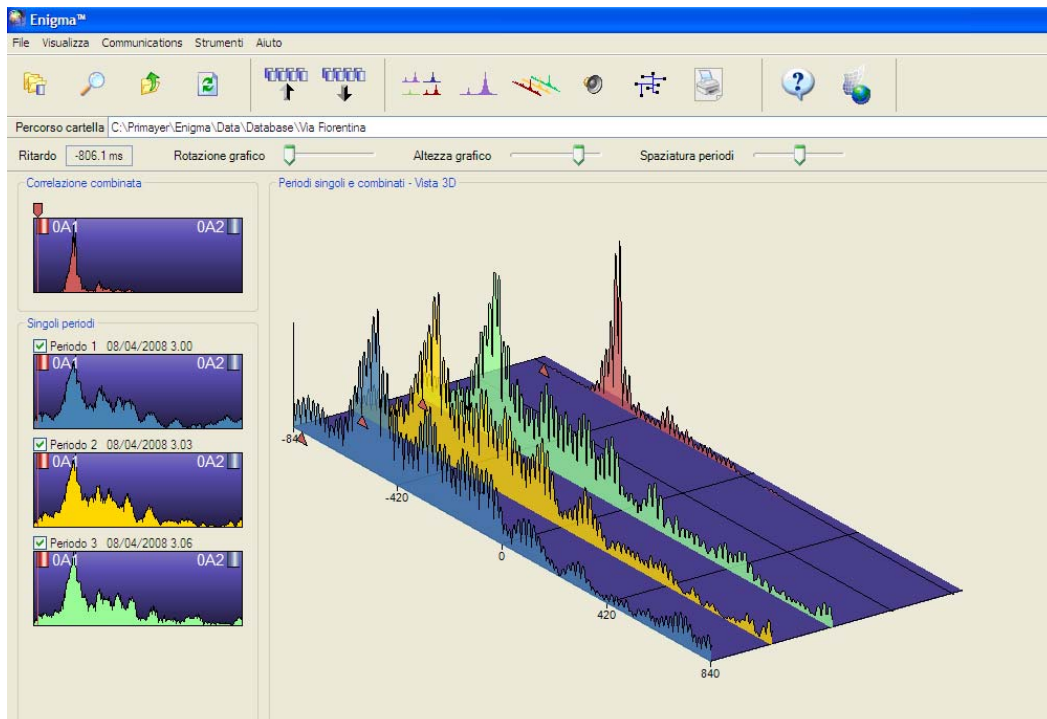
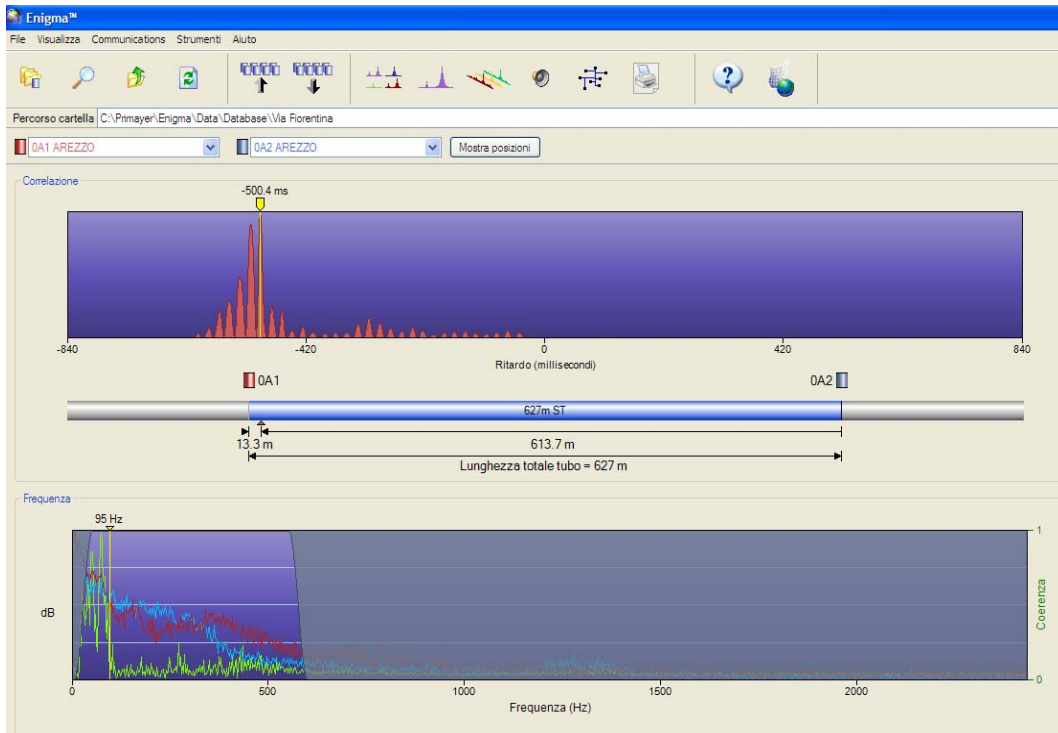
Schematics of the water leakage localization



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Schermate del programma PRIMAYER : Correlazione + Periodi correlazione
PRIMAYER software views : Correlation + Correlation periods

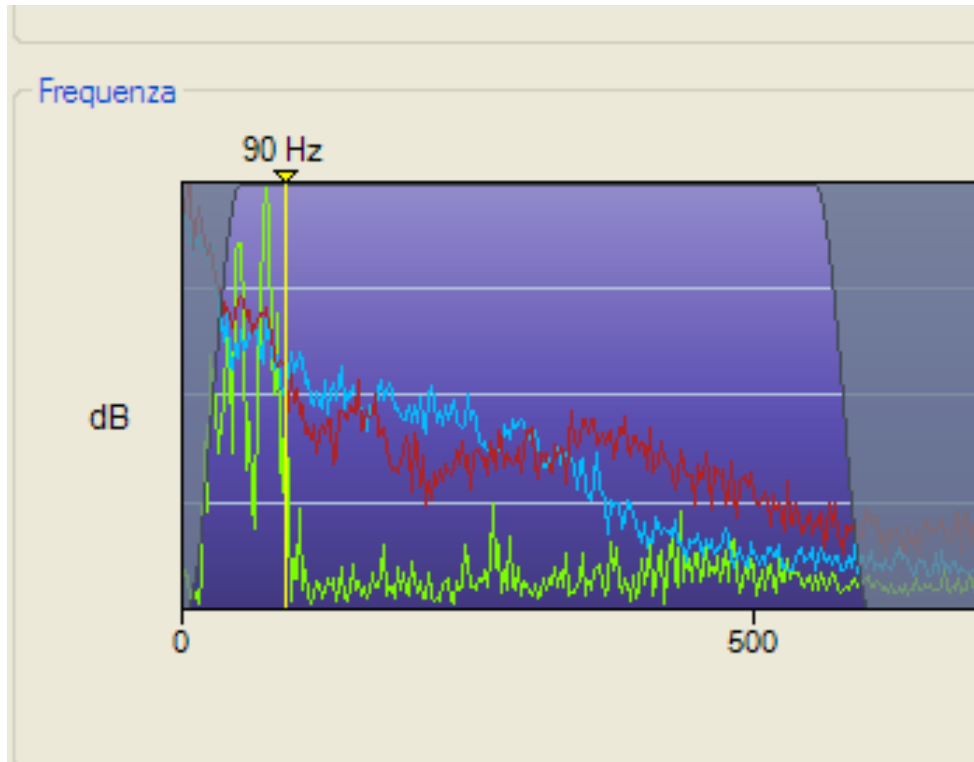




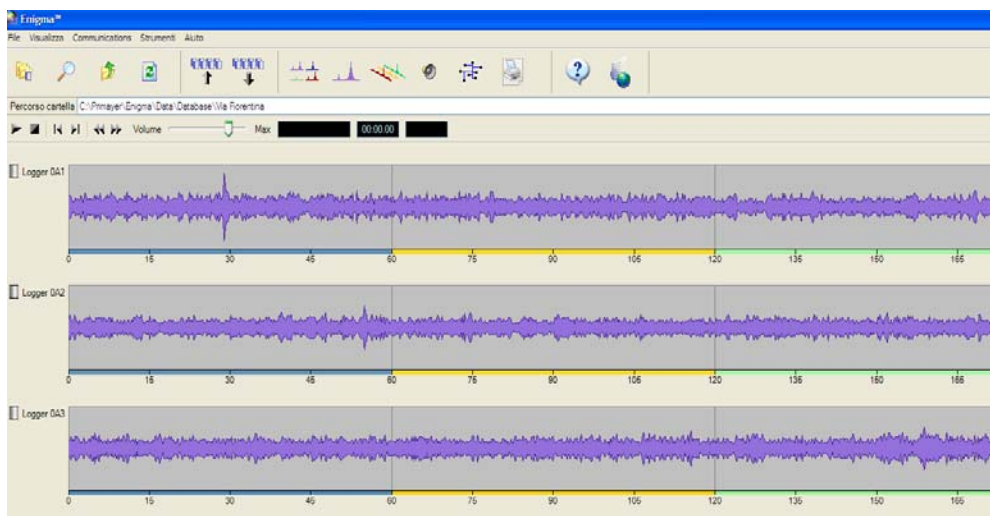
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Schermate del programma PRIMAYER
PRIMAYER software views



Funzione "Coerenza" : linea verde
"Coherence" function : green line



Traccia acustica degli idrofoni 1 - 2 - 3
Acoustic trace of hydrophones 1 - 2 - 3