T4.1 – P22 : The WNRS of IS48 infrasound station : Problems and solutions

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ABSTRACT

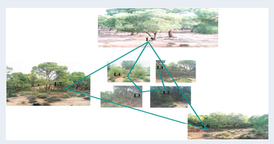
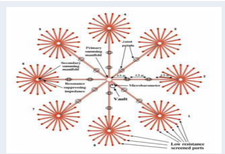
The Infrasound Station IS48, in Kesra-Tunisia is part of the verification regime for the Comprehensive Nuclear-Test-Ban Treaty. IS48 is managed and maintained by the Tunisian NDC. Its good location in the North part of Africa allows to have various and interesting detections. Several signals with different signatures were recorded and identified.
But since 2010, the performance of the station has began to be noisy , due to a leakage in the pipe array, despite efforts to solve the issue through the pressure test and maintenance . To this issues, PTS decided to upgrade the WNRS at IS48TN in April 2017.
In this poster we will present the new design of the Tunisian infrasound station IS48TN with highlight on its performance after the upgrade.

Introduction:

The IMS station IS48 located at Kesra-Tunisia was installed on February 2007 and started forwarding data on March 2007. IS48 is an Infrasound array station that is composed of seven sites and one meteorological station. The equipment at the IS48 is powered by a pack of 12V Batteries and 320 W solar pannls. Data is transmitted to the CRF through radio-telemetry (WI-LAN) network and forwaredd to the IDC/Vienna through VSAT.

I. I48TN: STATION OVERVIEW AND CHARACTERISATION

The Infrasound station IS48 is part of the verification regime of the Comprehensive Nuclear-Test-Ban Treaty.

Geographical Location The region of Kesra, 200 km far from the capital of Tunisia	
Design 7 elements array located in a forest	
Sensor Type	Microbarometer MB2005
WNRS 36m aperture rosette system (8 rosettes), Each rosette has 18 inlets	

II. The Performance of IS48 vs WNRS: Pressure TEST

Objectives (twice a year since 2009)

We try to identify by visual observation pipes problem and change them by applying the OM-IS-24-001 Pressure Testing of WNRS Pipe array rev0.1 to identify bad pipes.

Experience

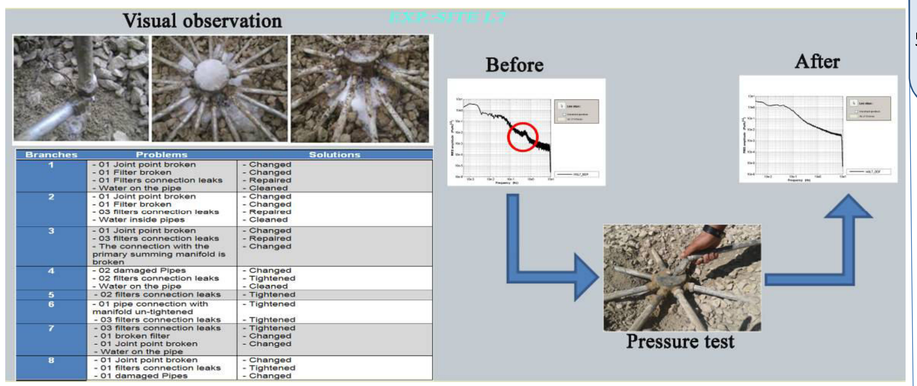
We make the pressure test in the different sites by connecting the air compressor to the WNRS branch port and observing the pressure for 30 minutes, then spray soapy water mixture on each joint point, pipe and summing manifolds.

Remove the filters from the end of each pipe in the array

Remove the gravels that cover the primary and the secondary summing manifolds and joint points

Connect the air-compressor to the WNRS branch port of the pipe

Results



Branches	Problems	Solutions
1	- 01 Joint point broken - 01 Filter broken - 01 Filters connection leaks - Water on the pipe	- Changed - Changed - Repaired - Cleaned
2	- 01 Joint point broken - 01 Filter broken - 03 filters connection leaks - Water inside pipes	- Changed - Changed - Repaired - Cleaned
3	- 01 Joint point broken - 03 filters connection leaks - The connection with the primary summing manifold is broken	- Changed - Repaired - Changed
4	- 02 damaged Pipes - 02 filters connection leaks - Water on the pipe	- Changed - Tightened - Cleaned
5	- 02 filters connection leaks	- Tightened
6	- 01 pipe connection with manifold un-tightened - 03 filters connection leaks	- Tightened
7	- 03 filters connection leaks - 01 broken filter - 01 Joint point broken - Water on the pipe	- Tightened - Changed - Changed
8	- 01 Joint point broken - 01 filters connection leaks - 01 damaged Pipes	- Changed - Tightened - Changed

Conclusion

The pressure tests of pipe arrays at IS48 do not solve the problem of noise (impact of high wind levels). A new approach to the problem of WNRS is required. A technical solution with CTBTO/PTS/IMS- engineering section was seen necessary.

Upgrading of IS48

III. Upgrade: installation and result

Partners : CTBTO (Vienne, Austria), Enviro-Earth (France) and CNCT (Tunis, Tunisia).

Group photo

Steps of the installation

1- Select location

2- Remove the old WNRS

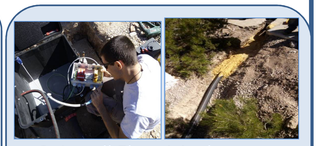
3-Prepare the location of the box (Pelicase)

4- Connect manifold central to Pelicase

5- Set the manifold of each rosette in place

6- Connect pipes to manifold

7- Do pressure test



8- Install Electricity between Pelicase and Vault

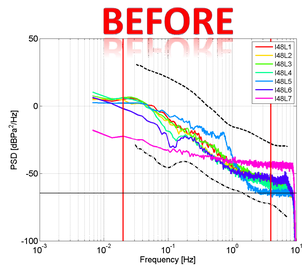
9- Install microbarometer

10- Validate data Using a referense microbarometer

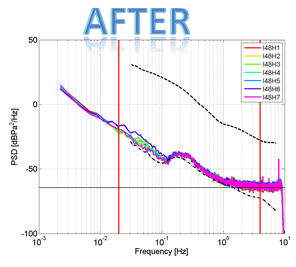
11- Fixe the Pelicase to the ground

Results

BEFORE



AFTER



- ❑ The background noise at the element sites are the same after the upgrade,
- ❑ The background noise is very low and very close to the low noise model,
- ❑ After the upgrade we can see that above 2Hz the background noise even reaches the self-noise of the sensor ,

➔ **Station has a very low background noise.**

- ❑ The Microbarom peak is visible at all element sites with the same amplitude,

➔ **All sites record the Microbarom signal in the same way.**

Conclusion

- The Best solution to solve the noise problem in the IS48 was to bring pipes up ground.
- Pressure test can be made now easier.
- First data interpretations show the quality and efficiency of the new WNRS system.