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Down Hole Test in Tirana (Albania)

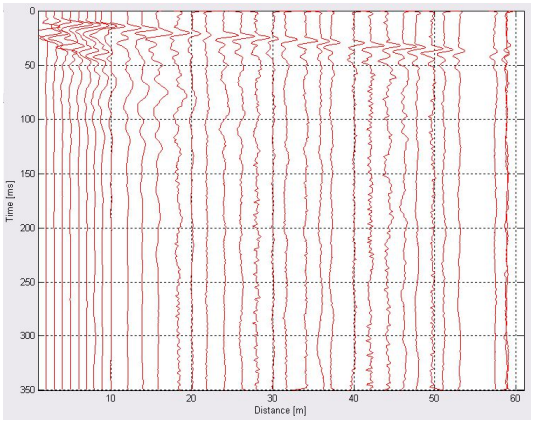
Basically, the method measures the time for seismic P and S waves generated by an impulsive source at the surface to travel to a sensor located at a sequence of depths in the borehole.

The essential components for an accurate DH measurement are:

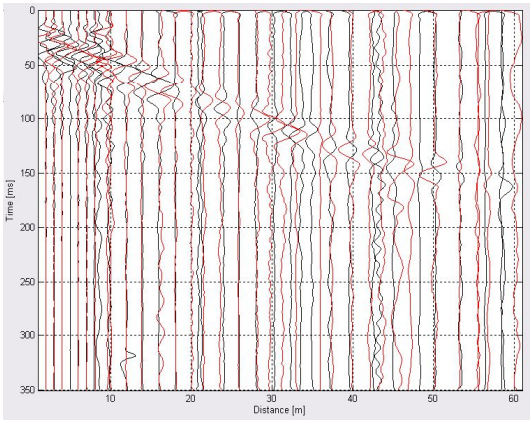
- An energy source (sledgehammer) able to generate energy-rich and directional elastic waves.
- A tri-axial geophone, arranged in a X-Y-Z- pattern, with appropriate frequency response and locked to the borehole wall by adopting a clamping device.
- A multi-channel seismograph, enabled to record the waves as digital signals on an appropriate memory.
- A transducer (trigger) sympathetic with the source, which is indispensable to properly identify the travel time from the moment of source initiation until reception.

The measurements have been obtained with a 24-channel seismograph RAS 24 (24 bits) whose acquired data have been directly uploaded on a laptop.
At 1or 2 meters intervals the source has been struck for P wave transmission as well as for S wave transmission, and travel time from the moment of source initiation until reception at the geophone has been recorded.
The energy source has been placed at the surface, at 2 meters distance from the top of casing.
In particular, polarised S-waves have been generated as reported also in fig. 1 by using the 'negative stack' method, consisting in collecting both positive and negative polarised S-waves, in order to enhance the S-wave signal respect to the P-wave, which, on the contrary, is weakened. In practice, every S-wave acquisition has been collected by hammering with a 10 kilo weight the opposite sides of a wooden beam, properly fixed to the ground. The pictures in attachment show the adopted device. At each measurement level, the 3D geophone is placed to that specific depth in the borehole and is clamped to the casing, verifying the absence of slips.
Then, the acquired data have been processed, and two distinct results are presented: the time-depth curve with velocity value at each level, and the time-depth curve with seismostratigraphic interpretation.

P WAVE RECORDS



CROSS OVER PLOT S WAVE RECORDS

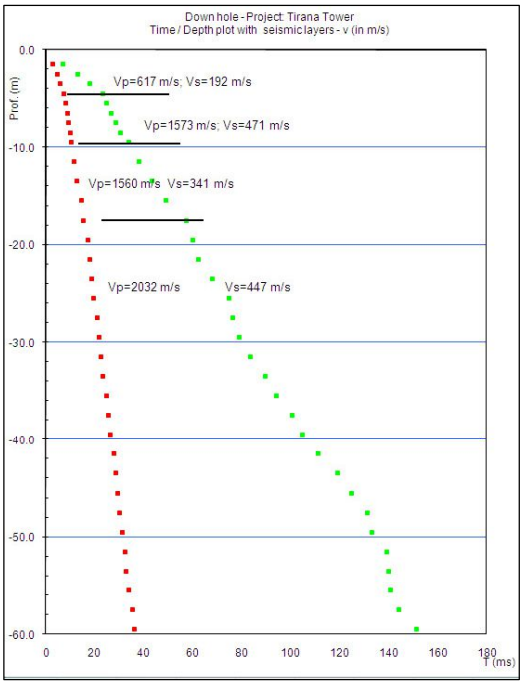


CALCULATED DYNAMIC PARAMETERS AT EACH SUB-LAYER

Prof. (m)	Vp1 (m/s)	Vs1 (m/s)	Vp/Vs	Densità (t/mc)	Poisson	G (MPa)	E (MPa)	Lamè	Bulk
-2	517	210	2,46	1,7	0,40	73	206	299	348
-2,5	368	119	3,09	1,6	0,44	22	64	168	183
-4	692	161	4,31	1,8	0,47	46	135	756	786
-4,5	696	173	4,02	1,8	0,47	53	156	750	785
-6	873	572	1,53	1,8		604	1358		603
-6,5	1657	500	3,31	2,1	0,45	521	1512	4687	5034
-8	2481	496	5,00	2,3	0,48	555	1642	12748	13118
-8,5	1463	516	2,83	2,0	0,43	543	1552	3274	3636
-10	1980	294	6,74	2,2	0,49	186	554	8087	8211
-11,5	1761	460	3,83	2,1	0,46	446	1306	5649	5946
-14	1588	379	4,19	2,1	0,47	297	874	4620	4818
-15,5	1078	348	3,09	1,9	0,44	233	673	1765	1921
-18	2135	242	8,83	2,2	0,49	128	382	9717	9802
-19,5	1307	713	1,83	2,0	0,29	1014	2612	1376	2052
-22	1858	949	1,96	2,1	0,32	1921	5084	3517	4798
-23,5	3210	333	9,64	2,4	0,49	262	784	23849	24024
-26	2197	307	7,16	2,2	0,49	207	617	10204	10342
-27,5	1628	1154	1,41	2,1		2770	5507		
-30	2204	828	2,66	2,2	0,42	1508	4276	7681	8686
-31,5	2183	433	5,05	2,2	0,48	411	1217	9648	9922
-34	2613	325	8,05	2,3	0,49	240	715	15049	15209
-35,5	1646	433	3,80	2,1	0,46	391	1143	4866	5126
-38	2188	308	7,10	2,2	0,49	209	623	10106	10246
-39,5	2189	488	4,48	2,2	0,47	525	1547	9487	9837
-42	1467	309	4,75	2,0	0,48	195	575	3997	4127
-43,5	3317	258	12,87	2,4	0,50	158	473	25867	25973
-46	2191	343	6,39	2,2	0,49	259	770	10045	10218
-47,5	2192	309	7,09	2,2	0,49	210	626	10149	10289
-50	1883	1026	1,84	2,1	0,29	2250	5799	3077	4577
-51,5	2193	344	6,38	2,2	0,49	260	773	10060	10233
-54	3323	2507	1,33	2,4		14964	25125		6340
-55,5	1651	1986	0,83	2,1		8222	51243		
-58	1651	591	2,80	2,1	0,43	727	2074	4226	4710
-59,5	2194	281	7,80	2,2	0,49	174	520	10245	10361

P AND S WAVES DROMOCRONES

(red = Vp; green = Vs)



VELOCITY INTERVALS GRAPH