Experience in the organization of monitoring, forecasting and risk assessment of environmental pollution

Dr F. Nicola Rossi

Laboratorio L.A.V. - ITALY

L.A.V. Laboratory

L.A.V. srl company established in 1982 with the intent to carry out chemical and microbiological analysis in the food and environment.
Through continuous investment in new technology, training and partnerships with research institutions, the LAV It has constantly updated its services and legislative developments to the needs of its customers.

- **Laboratory is certified ACCREDIA according to standard UNI CEI EN ISO IEC 17025 And ISO 9001:2008**

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO
LAB N° 0447

UNI EN ISO 9001:2008
CERTIQUALITY
SISTEMA DI GESTIONE QUALITÀ CERTIFICATO

L.A.V. Srl
LABORATORIO ANALISI AMBIENTE SICUREZZA SUL LAVORO

QUALIFIED LABORATORY

• ENI	• SIMAM
• EXXON MOBILE	• SIRAM
• SAIPEM	• ECOTHERM
• RSI	• MONTANA
• TAMOIL	• HERA
• API	• NCE
• ENVIRON	• FOSTER WHEELER
• ENI SERVIZI	• ENEL

INTERNATIONAL ACTIVITY

Since 2012 is operating the laboratory AST consists of a joint venture between the LAV and LTS, Turkish laboratory.
AST operates in the environmental sector, providing quality services for analysis and advice throughout the Turkish.

AST
Çevre Analiz Laboratuvarı

Yeniyol Sk. Etap Iş Merkezi B Blok D:10 K:3
Acıbadem/Kadıköy/ISTANBUL
Tel : +90 216 545 87 00
Fax : +90 216 545 87 03
http://www.astlab.com.tr

LABORATORY ACTIVITIES

The chemical laboratory of L.A.V. It is equipped with the most advanced instrumental techniques for performing chemical analysis and physical-chemical in different matrices:

- Analysis of wastewater and industrial water
- Analysis of groundwater , drinking water
- Analysis of soil and waste
- Analysis of emission

CHARACTERIZATION PROGRAM

historical reconstruction of the production activities and identification of objectives

Elaboration of preliminary conceptual model, preparation of investigation plan

Sampling plan (sampling point, target analytes, identification of sampling techniques

Elaboration of survey results

Elaboration of conceptual model final

Identification of acceptable residual concentration level and set operational project remediation

- Detailed description of the site and of previous activities
- Find correlation between past activities and pollution
- Description of environmental components
- Geological-stratigraphic description and hydrogeological

historical reconstruction of the production activities and identification of objectives

Elaboration of preliminary conceptual model, preparation of investigation plan

Sampling plan (sampling point, target analytes, identification of sampling techniques)

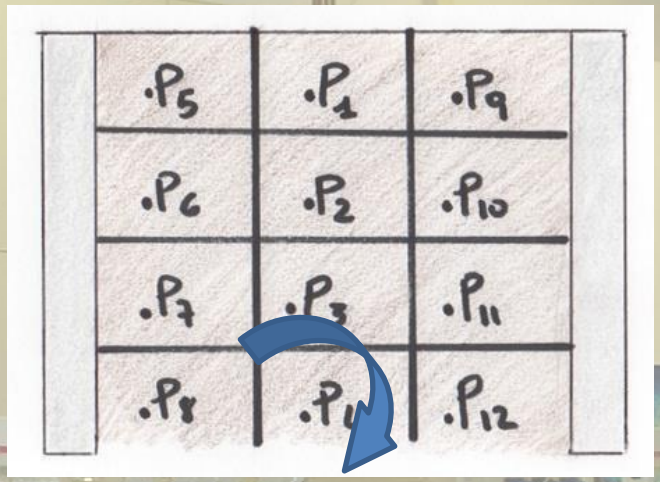
SAMPLING PLAN

Type of sampling (Random, statistical /systematic grid, judgemental…….)
Number of samples
Type and dimension of sample (primary and laboratory sample)

IMPORTANCE OF SAMPLING

METHODS OF SAMPLING AND MATERIALS USED HAVE A PRIMARY ASPECT IN PROCESS

Example of evaluation of sampling uncertainty for soil waste contaminated from TPH



In order to evaluate sampling standard deviation we have analyze single sample and composite sample with different random composition below reported:

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
C3a				•		•			•			
C3b			•		•			•				
C5a		•		•	•		•					•
C5b	•		•			•		•	•			
C6a	•	•				•	•				•	•
C6b			•	•	•			•	•	•		
C12	•	•	•	•	•	•	•	•	•	•	•	•

•	: Sub sample used to create a composite sample

Analysis conducted are TPH, metals and leachate

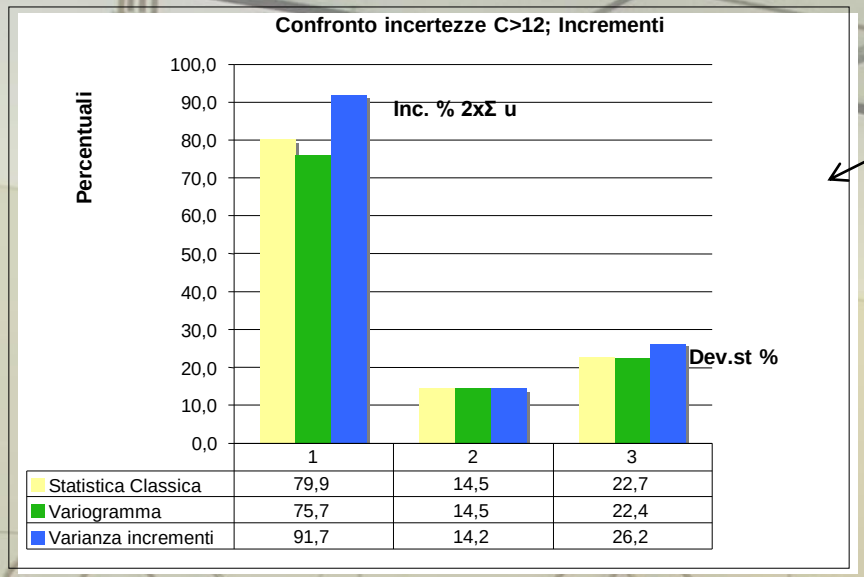
RESULTS

Incrementi	Idrocarburi > C_{12}
P1	1000
P2	949
P3	266
P4	436
P4d	449
P5	779
P6	300
P7	623
P8	824
P9	1028
P9d	912
P10	544
P11	339
P12	510

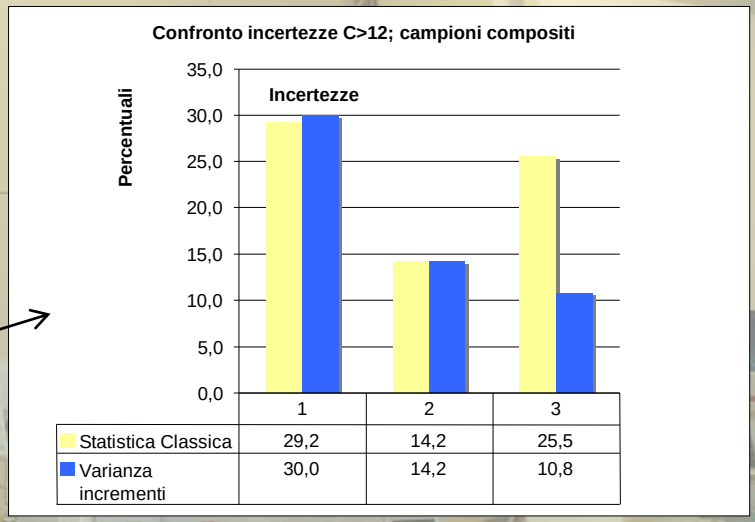
Campioni	Idrocarburi > C_{12}
C3a	651
C3b	650
C5a	658
C5b	452
C6a	720
C6b	666
C12	559

	As	Ba	Be	Cd	Co	Cr	Cu	Hg	Ni	Pb	V	Zn
P1	6,36	130,98	1,76	0	6,60	23,29	21,34	0	21,63	21,22	27,08	59,65
P2	8,06	168,33	2,64	0	8,44	33,36	25,94	0	27,89	18,69	42,34	79,66
P3	5,79	74,02	0,51	0	6,34	32,41	32,92	0	39,80	17,13	17,23	50,10
P4	7,78	146,52	1,47	0	7,72	43,25	35,32	1,57	31,96	19,09	32,35	60,90
P4d	5,55	104,68	0,97	0	5,66	18,61	28,42	0	21,57	15,22	17,50	47,16
P5	6,58	131,94	1,90	0	6,92	17,21	26,26	0	20,57	16,49	25,03	53,00
P6	5,60	89,24	0,66	0	6,98	52,11	29,04	0	35,92	19,12	22,57	73,97
P7	7,02	128,10	1,13	0,66	9,43	31,74	40,00	1,53	28,06	21,21	26,93	63,48
P8	6,55	171,52	1,22	0	7,04	31,76	44,37	0	28,30	18,22	26,24	51,09
P9	6,84	118,39	1,79	0	6,98	22,89	25,03	0	20,37	19,82	27,70	60,82
P9d	5,91	103,58	1,44	0	5,91	16,30	22,48	0	18,57	17,43	21,20	53,44
P10	4,92	110,94	1,47	0	6,92	35,19	23,08	0	28,37	14,16	30,39	50,48
P11	6,29	96,01	0,74	0	7,25	55,22	32,11	0	37,86	21,01	26,58	59,54
P12	5,84	138,10	1,20	0	7,08	35,69	28,59	0	44,22	12,42	26,87	43,86
C3a	5,96	94,42	1,01	0	5,89	7,87	23,21	0	23,84	17,48	18,24	51,70
C3b	6,08	139,69	1,65	0	7,40	9,81	24,19	0	27,40	17,27	27,46	53,34
C5a	7,09	144,30	1,73	0	7,90	28,50	36,88	0	26,32	25,59	29,68	62,85
C5b	6,36	123,17	1,35	0	6,92	39,64	34,50	0	28,92	20,02	28,65	57,92
C6a	6,40	114,31	1,41	0	6,61	30,27	27,68	0	25,97	18,31	27,22	55,01
C6b	6,49	120,75	1,42	0	6,56	28,79	23,43	0	24,39	14,79	28,40	51,69
C12	6,21	112,48	6,61	0	8,86	44,66	27,65	0	26,41	16,92	26,52	64,11

	COD	DOC	Cloruri	Solfati
P1	29.70	10.71	13.51	19.07
P2	28.00	9.93	15.11	57.13
P3	26.70	10.17	18.73	62.18
P4	25.60	9.87	17.40	28.30
P4d	22.80	7.62	16.36	31.12
P5	29.90	10.31	21.25	57.01
P6	27.60	9.92	18.95	59.16
P7	31.90	11.25	28.60	45.22
P8	30.20	17.74	15.31	29.02
P9	26.50	21.90	13.86	42.17
P9d	25.30	9.20	13.41	47.27
P10	28.10	25.20	18.91	56.11
P11	20.40	17.95	15.35	86.07
P12	25.70	26.08	9.01	19.57
C3a	21.90	8.51	16.84	40.38
C3b	25.50	9.01	17.27	49.01
C5a	20.90	7.79	14.13	38.76
C5b	25.00	9.64	14.21	44.06
C6a	25.80	9.17	16.80	45.72
C6b	27.20	9.39	18.03	46.07
C12	21.40	7.39	12.89	36.12



Single samples



Composite samples

From this example we see that results uncertainty is due to analitycal and sampling uncertainty and is different from single or composite sample.

Role of sampling is underlined by the many international methods published:

WATER:
UNI EN ISO 5667-1,2,…..23
EN 28265
EN 27828
EN 19458

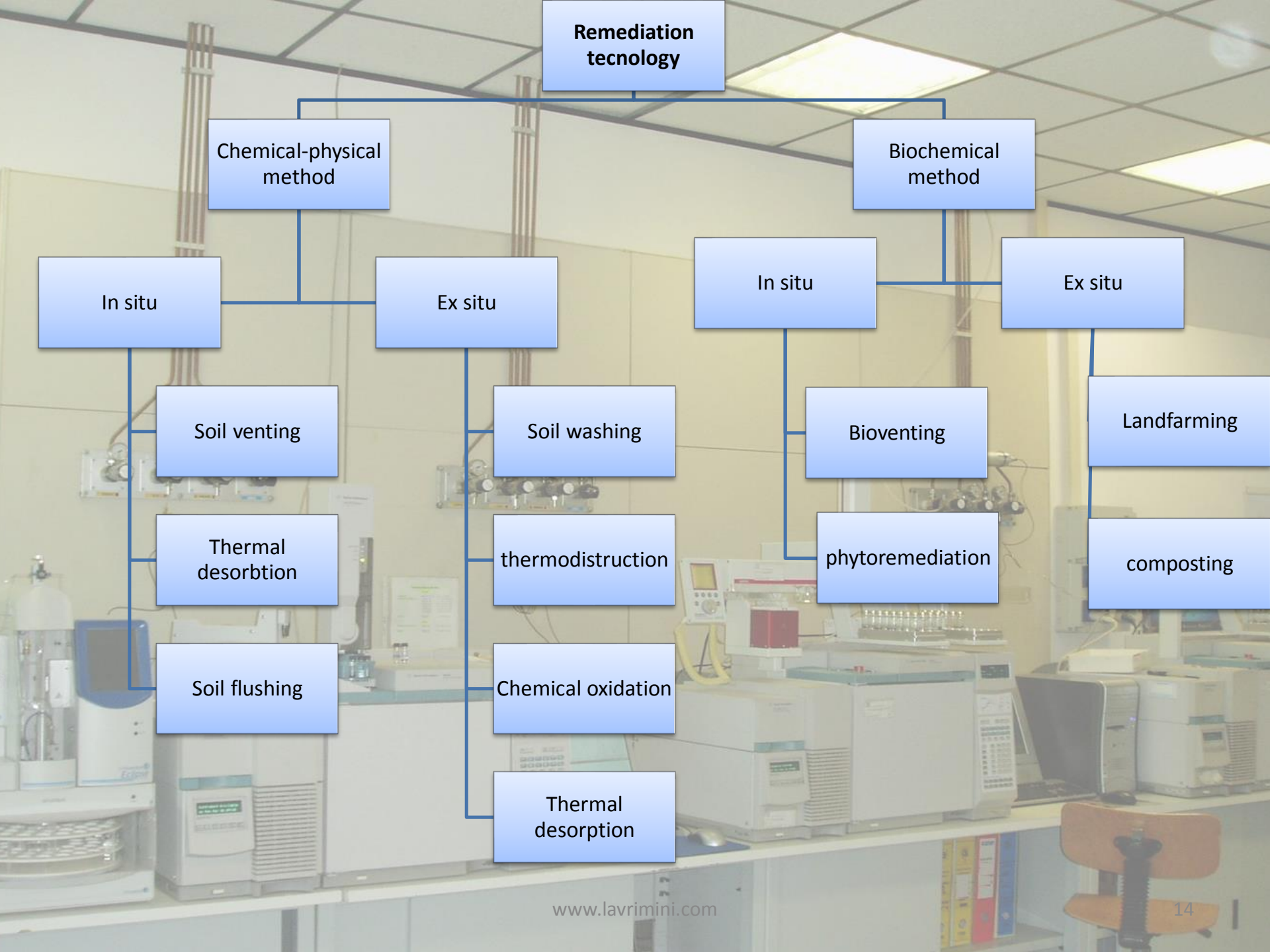
SOIL:
UNI EN 10802
EN 14899
EN 15002
CEN 15310-1/5
EN 14735
EN 12579
ISO 10381-1/8
ISO 11648

In results of an analysis sampling is often more important than laboratory determination

FROM:
analytical results
hydrogeological description
Type and extention of pollution

Elaboration of final conceptual model

Identification of acceptable residual concentration level by risk assessment and set operational project remediation


Remediation tecnology
Chemical-physical method
Biochemical method
In situ
Ex situ
In situ
Ex situ
Soil venting
Thermal desorbtion
Soil flushing
Soil washing
thermodistruction
Chemical oxidation
Thermal desorption
Bioventing
phytoremediation
Landfarming
composting

LABORATORY TEST

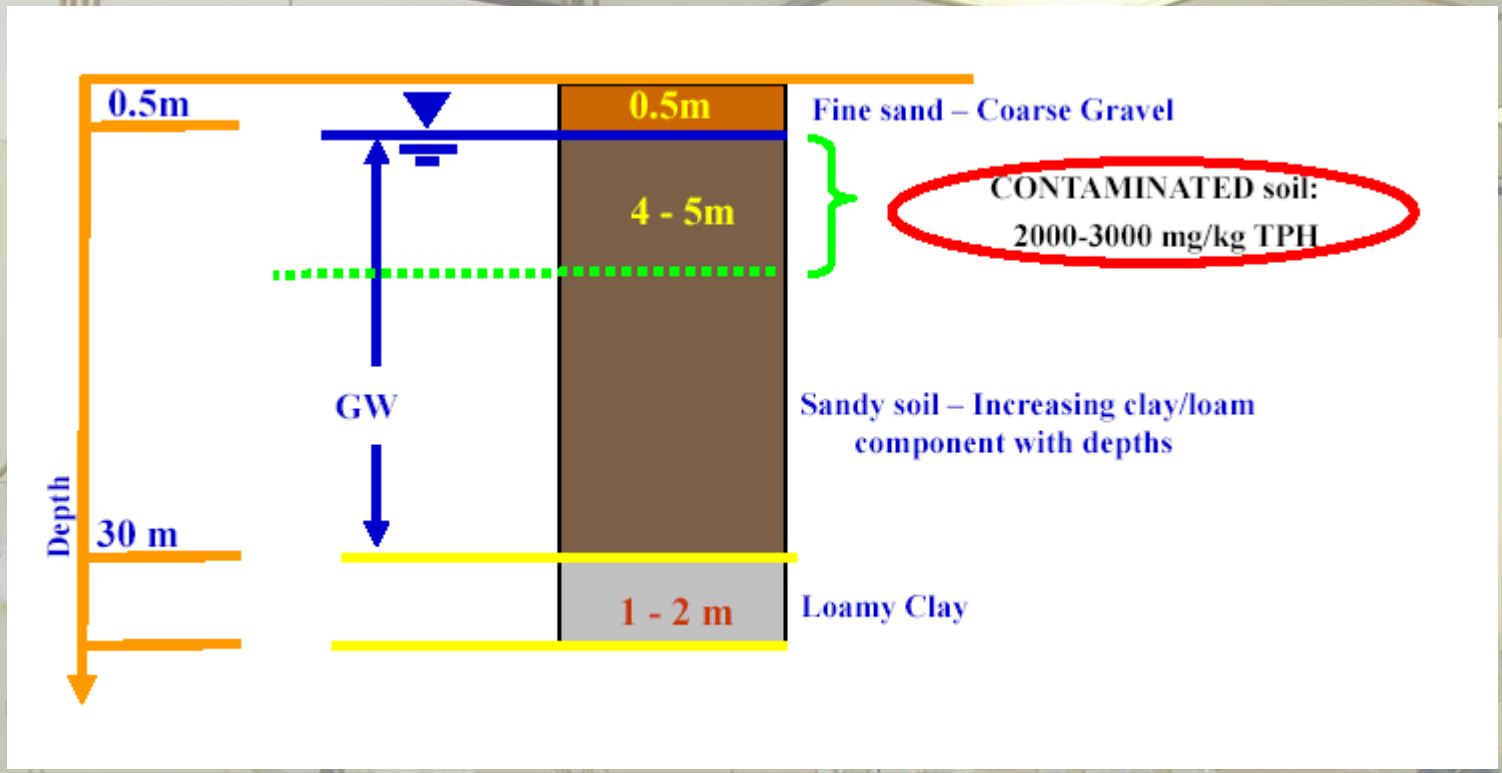
Target compound TPH,
Ex Refinery in a very extended area → Reduction of Hydrocarbon contamination by in situ remediation

1. Laboratory test to verify the effectiveness of the different oxidant
2. Chose of oxidant and reproduction an on site test in a small scale

Oxidant tested:

Potassium Permanganate
Sodium Persulphate
Hydrogen peroxide

No biological remediation tested due to soil characteristic and time required



After 72 h concentration of TPH in the soil in the test with hydrogen peroxide has fallen to 391mg/kg

GOAL ACHIEVED

lab test are replicated on site to verify results and check range of action of chemicals

ON SITE PROBLEM

Distribution pollutant hetergeneous
Some portion of site present VOC or PCB at level over 1000 ppm

Necessity of using remediation techniques combined:

On site chemical oxidation and out site remediation tecnicque depending from concentration level of PCB

ROLE OF THE LABORATORY

In Europe there has been an evolution of environmental law regarding soil , water and waste. Main change involve monitor of new compound, lower limits of detection.

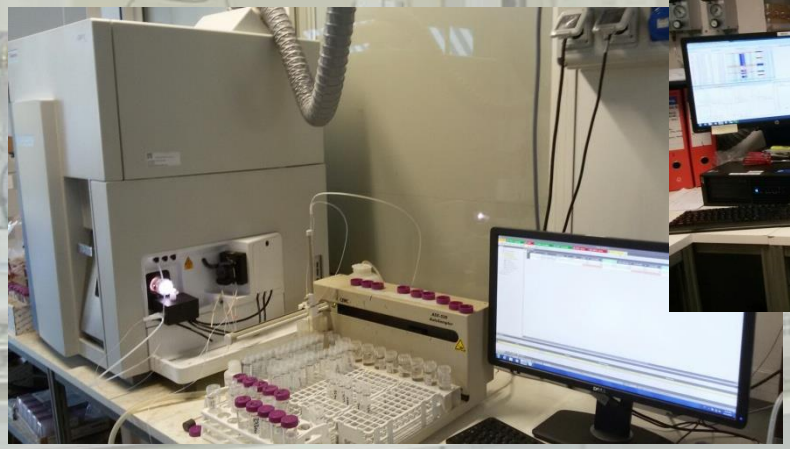
An example is new regulation CE 1342 regardings change in previous law and introduction of new POPs:

Pesticide
PCN
PBDE
Polychlorinated alkanes C10-C13
PCB
PFOS/PFOA
PCDD/PCDF

ROLE OF THE LABORATORY

parallel laboratories have undergone a technical evolution:

ICP/MS
GC-MS/MS
GC-HRMS
HPLC-MS



THANKS FOR ATTENTION

L.A.V.

WWW.LAVRIMINI.COM