



THE SNIFFERS

Realizing your Environmental and Sustainability Ambition



Pipeline Integrity

Cindy Verhoeven
28-10-2019





Site Surveys



Pipeline
Integrity



Emission
Reduction



Energy
Savings





Pipeline Integrity Services

Achievements and Results



650.000 km Pipelines inspected



20.000 yards supervised



100.000 km Gas Leak Surveys



12.500 Detected Leaks



46.000 Cathodic Protection Measurements





Pipeline Integrity

Broad range of Services



Pipeline Localization & Digitalization



Pipeline Leak Detection
Sat, Heli, Drone, Car, foot, dogs



Corrosion Coating & Cathodic Protection Surveys



Pipeline Inspection & 3th Party Interference



Pipeline Information Management Software PERSEUS



Innovation: Short Circuit Detection, IoT, Ai, Remote Sensing, Drones & Satellites



Training Competence Development



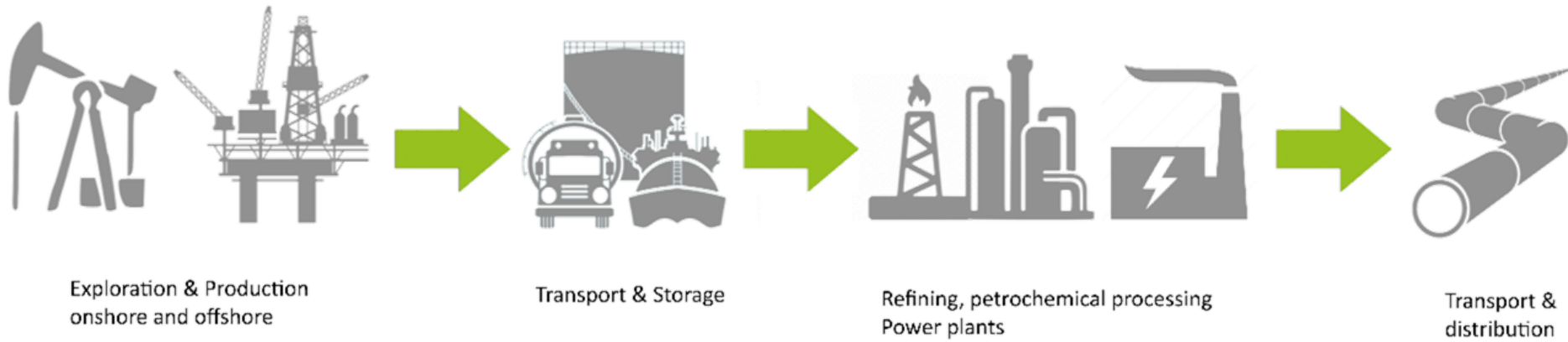
Pipeline Integrity Program Development



Pipeline Lifetime Extension Assessment



Emission Reduction



From Well to Market

Wells – E&P
Processing
Transportation
Storage
Distribution

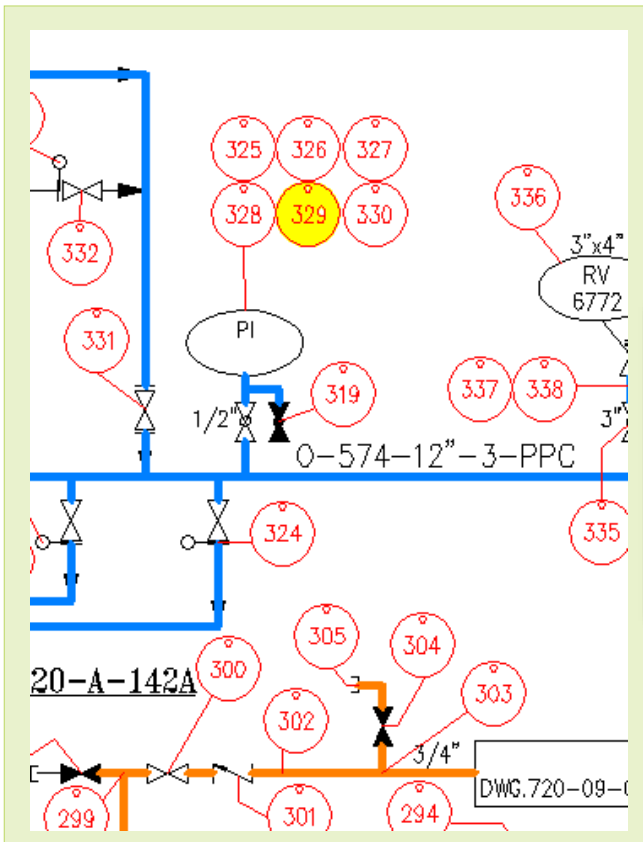
Emission Types

Unintended or Fugitive Emissions
Flaring and Venting
Gas driven Equipment
Safety Infrastructure
Maintenance Activities

Emission Sources

Emission management program

Inventory:
Detailed & high quality



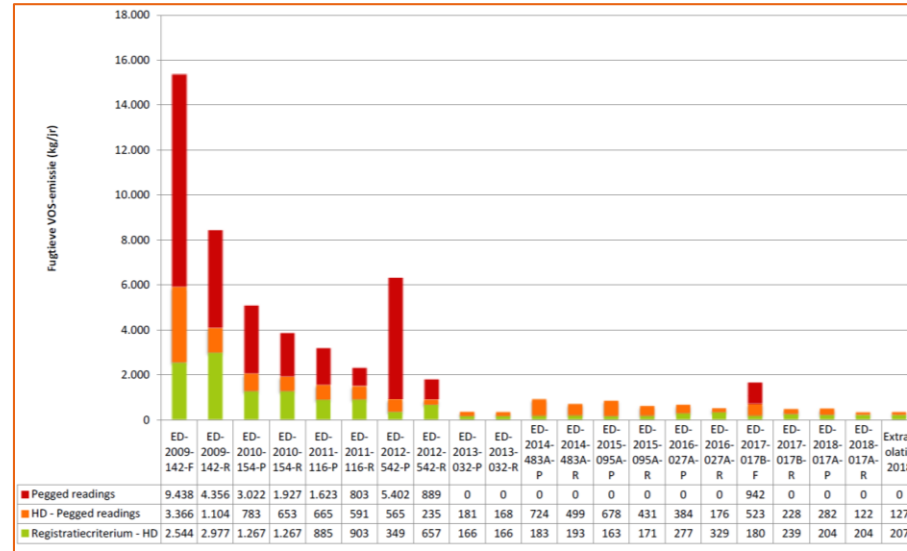
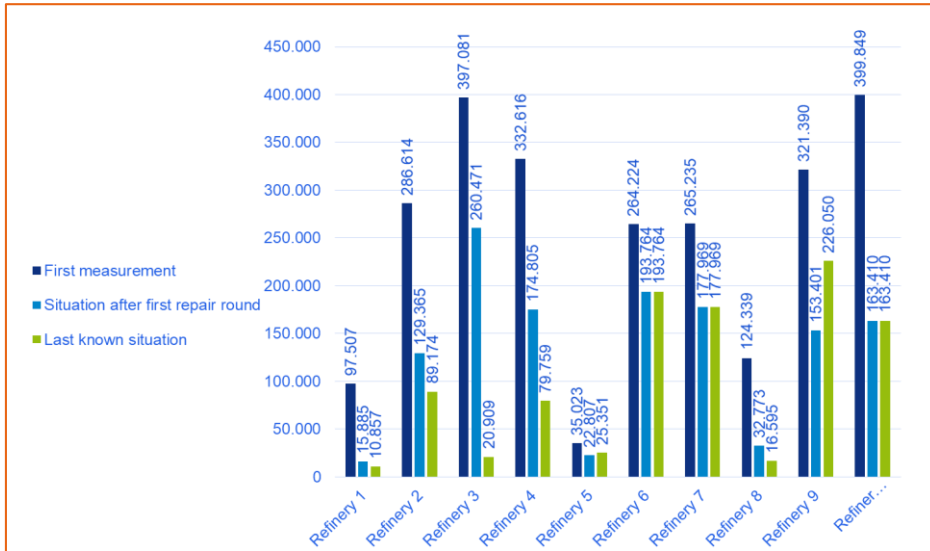
Measurements:
Technology agnostic



Emission reporting:
Overview, Drill-down, Benchmark



DIFFERENT RESULTS FOR DIFFERENT STAKEHOLDERS



Fugitive Emission Monitoring - Repair Order

Leak equipment code: 433 Applicable protocol: EPA
 Source code: 2 Calculation method: Correlation 800ml
 Company: Type: YTD

Equipment / Leak source localization		Equipment / Leak source information	
Site:	REFORMER	Equipment:	VA Valve
Unit:	10-T403-H01	Equipment ID:	GA Gate
Drawing:	10-T403-H-01	Source:	FL Flange
Stream name:	BTX201-G	Source position:	OU Outlet
Composition:	CO&H2	Barcode ID:	
System:	METHANE	Size:	0.75 IN
Line:	M1-PA(2)	Insulation:	No
Access level:	0	SNP-code:	PS
Equipment location:	2.75m NW of M1-PA(1), 1m	Manufacturer:	

Measurement date	PM	Leak kg/yr	Working hours yr	Remark	Repair Action	Access status	Operation status
12/05/2012	800	211.19	8.616			AC	
12/01/2012	2780	223.06	8.616			AC	

Maintenance team info		Repair cost	
Repair date:		Repair estimator:	
Repair action:	Replace packing	Repair cost:	

Printed by: Report printed by SMap.net from The SMap Date: 19/10/2012 Generated with S.F.E.M.P. software

- **Maintenance:** Detailed leak traceability and repair information, SAP integration, update of database with new or changed components, bad actors.
- **HSE:** Leak follow up information and emission values, with higher focus on HAPS and risks, emissions per medium, compliance.
- **Management:** Success rate of LDAR program, emission reduction, benchmarking
- **Board:** Corporate social responsibility, positioning of the company
- **Authorities:** Compliance audits, legislation

SOURCES BASED MEASUREMENTS

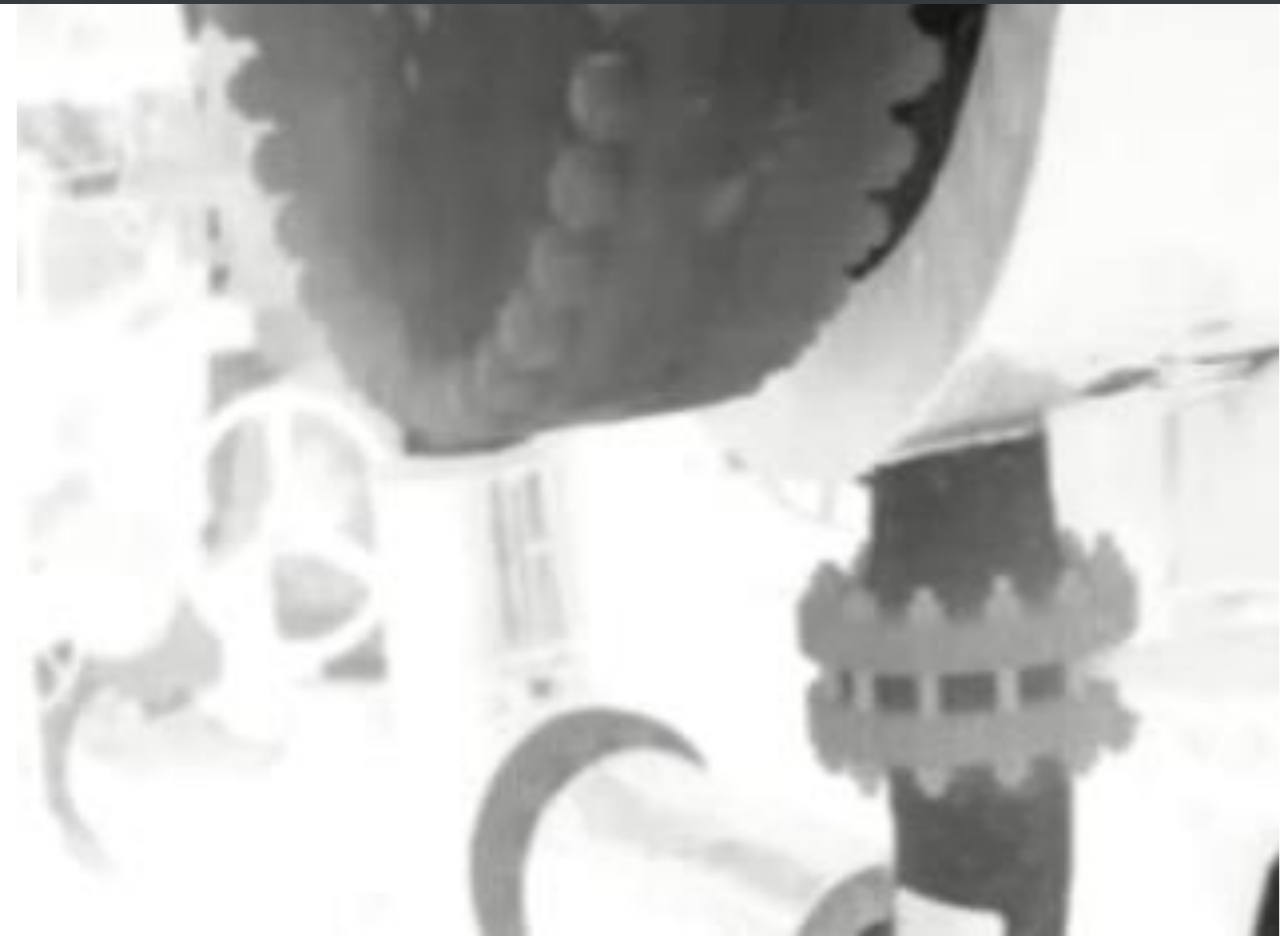
- Bagging / HFS:
 - 50-100 sources / day
 - Direct loss measurement (Kg/yr)
 - Most accurate field measurement
 - Development of new emission correlation factors (e.g. CH₄)
- Sniffing (FID, PID, :
 - 700-800 sources / day
 - Concentration measurement, converted in to loss using correlation tables (EPA M21 SOCOMI, PI)
- OGI (infrared camera):
 - 2000-5000 sources / day
 - Only qualitative, converted in to loss using average leak rate tables (API leak-no-leak), or combined with HFS / sniffing for quantification



EXAMPLE LEAKS DETECTED WITH OGI



EXAMPLE LEAKS DETECTED WITH OGI

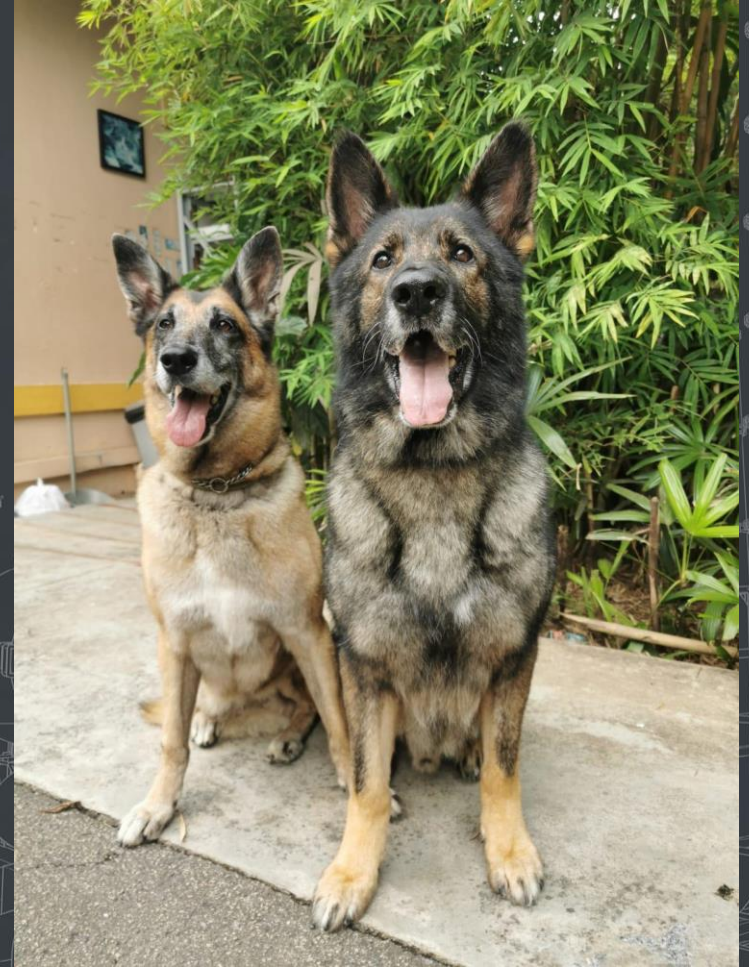




THE SNIFFERS

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Leak detection with Sniffer dogs



LEAK DETECTION WITH CANINES

The *highest probability* of finding the smallest leaks and illegal taps.

HOW?

1. Unique interaction between dog and handler:

- Giving and interpreting signals (Bidirectional)
- Pipeline knowledge and experience

2. Effective training and working method:

- Define the right walking path, in changing circumstances
- Dog picks up molecules and goes to the source, which a normal measurement device cannot do.

3. Measurement tool with highest sensitivity in the world: the dogs' nose



UNDERGROUND PIPELINES





Pipeline integrity



Our area of expertise:

- Pipeline Leaks: Detect the smallest
- Third party Interference
- Illegal tapping
- Corrosion
- Soil Contamination
- Ground Water Pollution
- Oil, fuels, Methane, VOC's, H2S, chemical substances

Key success factors for finding illegal taps with dogs:

- Our dogs are *trained pipeline inspectors!*
- Our dog-handlers are also pipeline inspectors and technicians with knowledge of pipeline assets.
- Unique combination of the dog's sensitivity, experience, and relationship with dog handler

We are pipeliners

Continuously sampling air at the highest speed and sensitivity



Breathing out

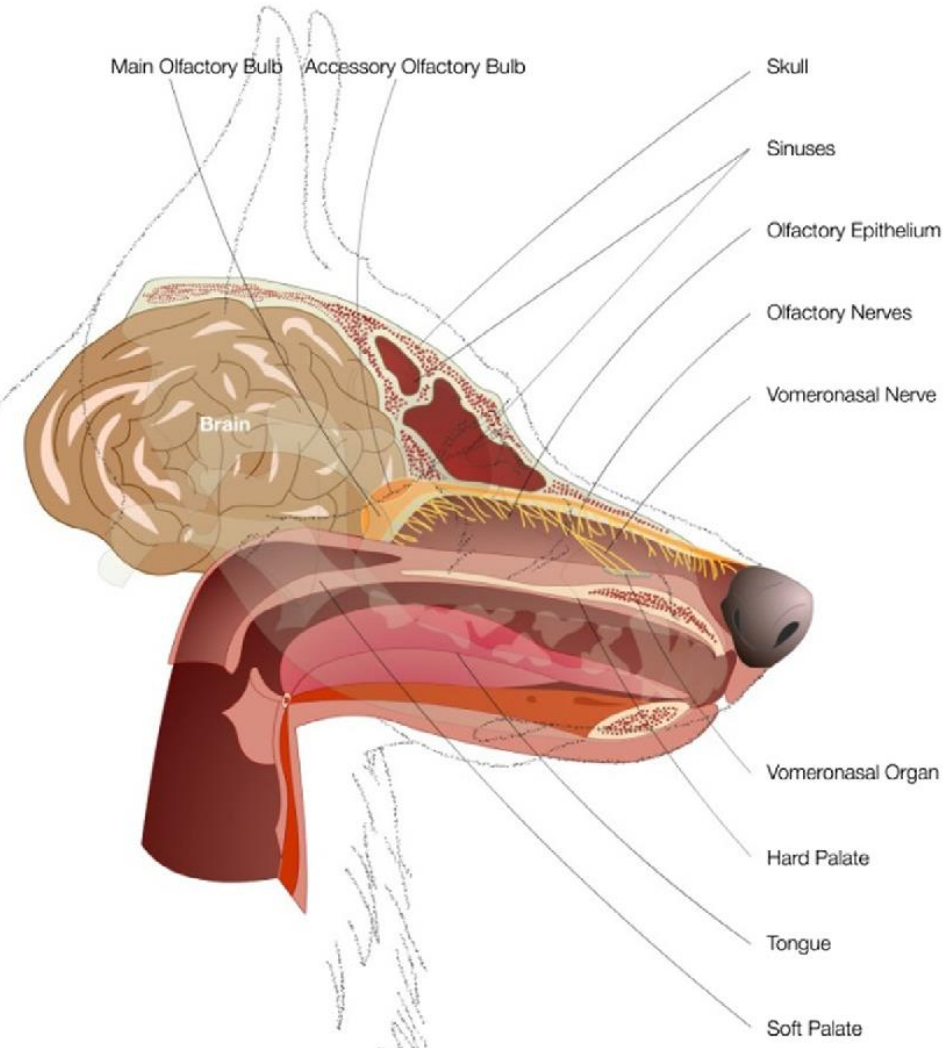
Breathing in

more than 200
million scent
receptors



THE BEST DETECTION DEVICE IN THE WORLD

A dog "sees" the world with his nose



- The canine olfactory system consists of soft tissue, bones, nerves, and parts of the brain. The soft tissue and bony structures make up the cavities into which odor particles flow. These cavities are lined with scent receptor cells which connect to olfactory nerves that connect with the olfactory lobe of the dog's brain.
- Dogs have large folds of mucous membranes inside their nose containing more than 200 million scent receptors compared to smaller areas of mucous membranes containing about 4 million in humans. Their olfactory bulbs are also about 4 times larger than ours. Their noses are also uniquely designed to draw air samples through — They can smell a few parts per billion (PPB), where the most sophisticated equipment can only measure parts per Million (PPM).

TRAINING PROGRAM:

1 year initial training + continuous ongoing training for expansion of difficulty and experience level

1- Selection of the best dogs; Breed, character, physique

2- Basic police dog training; behavior, obedience

3- Identify hydrocarbon sample in one box

4- Training the dogs to identify various hydrocarbons

5- Training the dogs to identify different smells against background odors

6- Training the dogs on pipeline samples

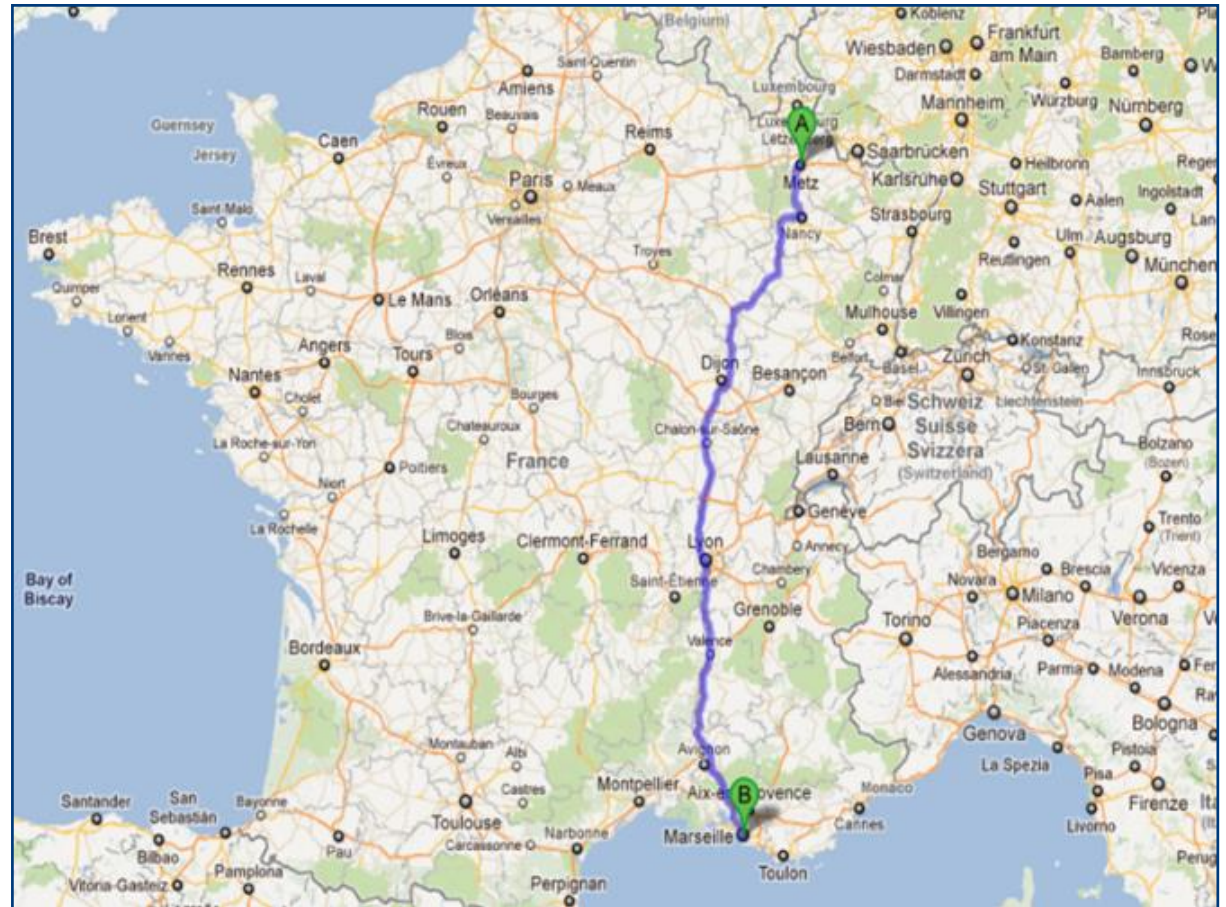
7- Higher difficulty levels, minimizing leak sims

8- Always positive reward for result



Example case: Leak detection through France

- **800 kilometres** of underground Ethylene pipelines in France through rural area
- Two specialized dog handlers – 4 months
- **Diversity of landscapes**
 - Alps with mountains 1200 meters, rivers, paddocks with angry bulls, barb wire fences, suburban areas, private properties, highways, railways,...
- Final Detailed inspection report
 - Not Accessible Areas, remarks on leak indications, Google Earth files with GPS coordinates of walked route



DOG EFFICIENCY AND AFFECTIVENESS STUDY, GERMANY

Comparative study on German Propylene Pipeline

In rural area's through agricultural corn fields from Cologne to Dormhagen

Time & team capacity: 2 dogs & 2 handlers in comparison to 8 people with equipment

→ Dog team faster detection method

Quality: dog team found 4 leaks and equipment team only 2

→ Dogs have a bigger range (50 meters)

→ Equipment searches only straight underneath

Result comparative study – TÜV protocol

After this case study and after an intense evaluation program with TÜV, The Sniffers received the official certification for the dogs and the handlers' working method



CASE EXAMPLE: ILLEGAL TAP DETECTION GEORGIA

Loss of pressure in the pipeline

Suspicion of an illegal tap

The pipeline was checked every day by guards on horses, with no result

Check of 200 Km pipeline in Georgia for illegal taps

Duration project - 2 weeks with 2 teams (trainer + dog)



Perfectly hidden illegal tap

After searching



CASE EXAMPLE: ILLEGAL TAP DETECTION BRAZIL

Detection of illegal tap in Brazil

The dog picked up smell a few hundred meters before the site and indicated the exact spot immediately, when walking over it for the first time.

Only a few drops of spill are sufficient.

The dogs are by experience also sensitive to:

- Change in vegetation (due to longer active illegal tap)
- Change in smell of disturbed earth (due to digging or covering up)



ULTRA HIGH SENSITIVITY: SHORT CIRCUIT DETECTION ON UNDERGROUND ELECTRICITY CABLES

locate electrical short circuits

Developed together with Electricity Provider after intense research period

Fast localization and repair of short circuits is essential to limit downtime

Detection of short circuits with equipment is:

- **Difficult:** Urban areas, difficult acoustic methods combined with costly measurement trucks
- **Very slow:** All connected houses have to be disconnected from the inside.

Dogs locate short circuits **accurately and fast**, without additional equipment, without having to enter or disconnect houses.



EXPERIENCE IN DIFFERENT CIRCUMSTANCES IS KEY!

Other references*:

Leak detection and illegal tap detection in:
Brazil, Georgia, Bolivia, France, Italy, The
Netherlands, Belgium, Singapore, Spain and
Germany

* Due to confidentiality, detailed customer information cannot be disclosed



Paco verifies leak location

Mecky finds difficult sample: Some of our dogs still dig to indicate, Mecky is trained to sit (preferred method)



Mecky finds underground leaks against difficult background odors of hydrocarbons



GERMAN TÜV CERTIFICATION OF DOGS AND TRAINING METHOD

TÜV NORD

Zeugnis über die Eignungsprüfung zur Detektion von Undichtheiten

Hiermit bescheinigen wir, dass der

Hund Senna

Rasse: Mechelse Herder
Geschlecht: weiblich
Zuchname: Senna
Geb.-datum: 16.07.2010
Chipnr.: 528246002066699
Geprüfte Gase/ Flüssigkeiten: Ethylen/Propylen/ Rohöl/Toluene

der Firma
The Sniffers
Poelierstraat 14
2490 Balen, Belgien

geeignet ist, schleichende Undichtheiten einer Rohrfernleitungsanlage im Sinne des Abschnittes 11.5.2.3 der TRFL festzustellen.

Verbindlich ist unser „Bericht über die Eignungsuntersuchung der Sniffers (Spürhunde) zur Detektion von Undichtheiten“ SEP-165/13 Nkp/ Keb vom 12.08.2013

Essen, den 12.08.2013


 TÜV Nord Systems GmbH & Co.KG
 Bereich Energietechnik
 Abteilung Prozessindustrie

Bestätigung der Gültigkeit durch den Arbeitgeber für die folgenden sechs Monate

Datum	Unterschrift

TÜV NORD

Zeugnis über die Eignungsprüfung zur Detektion von Undichtheiten

Hiermit bescheinigen wir, dass der

Hund Casey

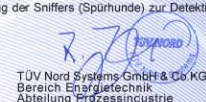
Rasse: Deutscher Schäferhund
Geschlecht: weiblich
Zuchname: Queen vom Schloß-Zweibrüggen
Geb.-datum: 31.03.2007
Tätowierungsnr.: G-C 2071
Geprüfte Gase/ Flüssigkeiten: Ethylen/ Rohöl/Toluene

der Firma
The Sniffers
Poelierstraat 14
2490 Balen, Belgien

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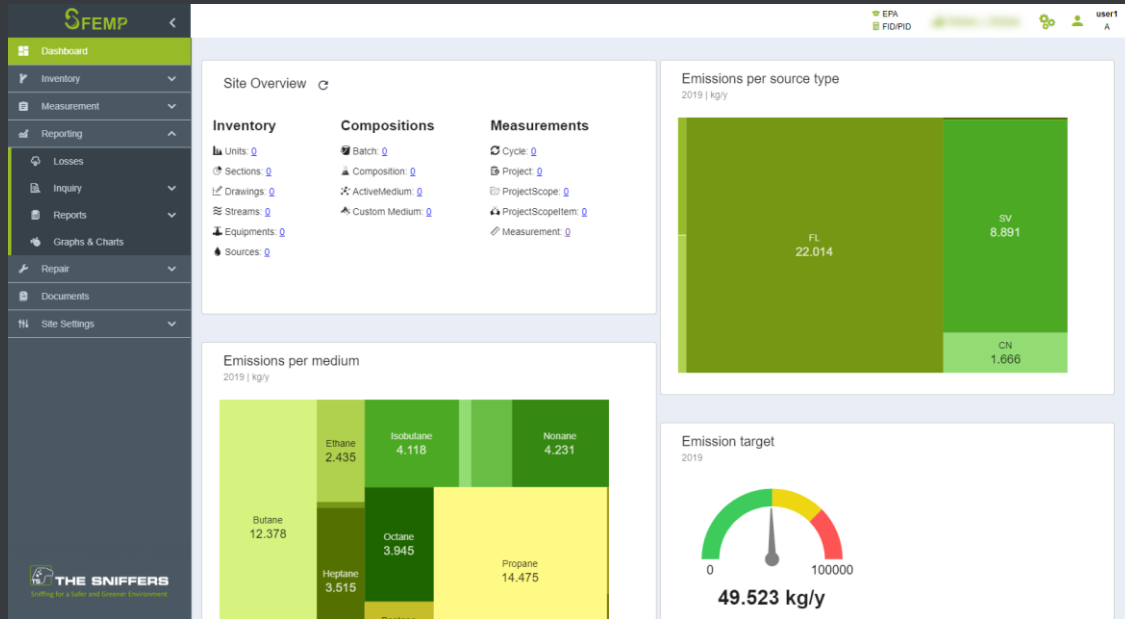

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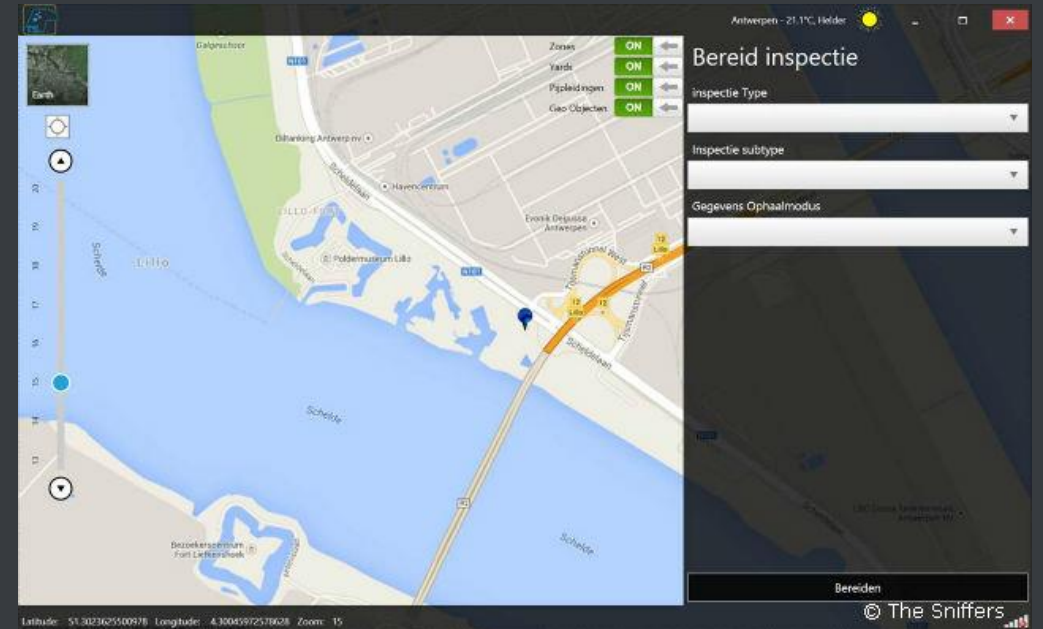
SFEMP

Sniffers Full Emission Management Platform



Perseus

Pipeline Information Management System



In-house developed proprietary software
platforms

Project preparation:

- Data gathering
- Project planning, permits
- Safety requirements
- Logistics

Onsite detection:

- leaks + illegal tap detection
- verification and quantification with best in class devices
- accurate GPS logging
- Data logging: Perseus software

Reporting:

- KMZ, KML file
- High quality report through Perseus software
- All image and GPS material

PERSEUS Welkom in het veldwerk | Inspectie | AL0031

Home | Acties | Geo Objecten | Personen | Leidingen | Inspecties | Tracking Toestel | Werven | Zones | Zone Groups | Basic Data | Operations

Inspectie | Het is nog niet voltooid | Opslaan

Naam: AL-2016-0300 - NB19 | Klantenservice: Air Liquide Industries Belgium sa
 Type: Trip | Status: Gestaan
 Startdatum: 11-1-2016 07:35:33 | Einddatum: 11-1-2016 10:45:58
 Zonegroep: NB19 | Apparaat naam: 1-4LP-431
 Wier: Ragen
 Operator: laet michelse

Geo Objecten | Trips

Geo Objecttype	Adres
MS-NB-019-219-C	Merkhaal
TR-NB-000-219-C	BO Kaat
MS-NB-000-219-C	Merkhaal
YD-2015-0000	Vand
YD-2015-0004	Vand
YD-2015-0006	Vand
YD-2015-0733	Vand
MS-KX-KX-0212	Merkhaal
MS-KX-KX-0214	Merkhaal
TR-NB-011-219-C	BO Kaat
MS-NB-0210	KB Paal

PERSEUS Welkom in het veldwerk | Inspectie | AL0031

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WIEB | Voorspelling

Huidig weer: Dagen, België
 8.4°C | Humiditeit: 72% | Wind: 4.3 km/h

NIEUWGELOOTEN ZONES

Name	Status
Klantenservice: Air Liquide Industries Belgium sa (Totaal: 2)	
NB001 Schiede-Rijnwinding POA RD - Buisweg POA RD	Afgevoerd
NB011 Nieuwatenheuvelland (grens BFR) - SP Zonnepaneel	Afgevoerd

ACTIEF WERVEN

Name	Status
YD-2015-0007	Actief
YD-2015-0008	Actief
YD-2015-0009	Actief
YD-2015-0010	Actief
YD-2015-0011	Actief
YD-2015-0014	Actief
YD-2015-0015	Actief

GEOPENDACHES

Name	Status
Klantenservice: EPM (Totaal: 12)	
Sticker plaatsen	Gemaakt
Sticker plaatsen	Gemaakt
Sticker plaatsen	Gemaakt
Sticker plaatsen	Gemaakt

NET GEDEGENEERD INSPECTIES | **TRIP INSPECTIES** | **EMMEL GEO OBJECT INSPECTIES**

AIR LIQUIDE | **INTERVENTIERAPPORT** | Werfbezoek | **AL-2016-03071**

Klant: Air Liquide Industries Belgium sa | Operator: kris.wuyts

Werf: YD-2015-0959 | Type werf: Werf | Datum: 08/01/2016
 Veldstraat 3945 Ham | Van: 6:30
 NB16 | Tot: 11:30

Zones: NB16 | Opmerking: 66 KM
 Leidingen: H2 | Dossiernr.: TPA/NB/15/3108/1619C/GM
 Aanvraagnr.: KLJM-CICC 7a2a8a03-67b6-4945-98f6-03643072133

Beschrijving werken: HDD en graafwerken

Opdrachtgever: Ruimte Vlaanderen Limburg | Uitvoerder: De Schaepmeester bvba
 Koningin Astridlaan 50 bus 1 | Maesbossen 1
 3500 HASSELT | 9160 LOKEREN
 Contact: Michel Vermeulen | Phone: 0032 474 95 94 13

Veiligheidsmaatregelen | **Opmerkingen**

- Analyser CO/O2/LEL
 - Permanent toezicht

Type werk: Boring (Kruising) | Werk methode: Mechanisch | Type kruising: Boring
 Diverse ondergrondse werken | Handmatig | Onder

Perimeter: Voorbehouden zone | Afstand tot leiding: -
 Afstand kruising: 2,50 m | Diepte leiding: 1,90 m

Werf: YD-2015-0959 | Notities/Opmerkingen: AL0031-2016 De uitvoerder heeft een boring gedaan in kruising met de H2 idf met een tussenafstand van +/- 2.50 M. Bij het uitvoeren van de boring kwamen ze uit op een tussenafstand van 2,25 M.

Leidingen: H2

Actie	N	U	C	Laatste Act.	Status
08.935] Werfbezoek / Werf bezoeken	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	08/01/2016	Afgesloten
08.936] Visuele Controle / Detecteren	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	08/01/2016	Afgesloten

Foto's

08_40_50.jpg

Documenten

AL0031-2016 A.pdf
 AL0031-2016 T.pdf

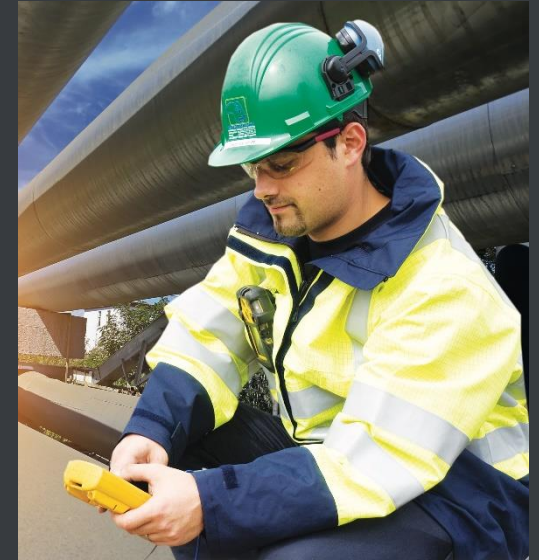
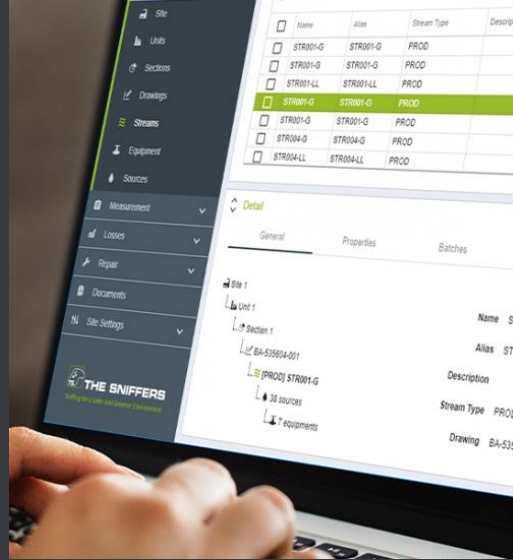
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Complete service:

Project preparation → onsite detection → data analysis and Reporting

REFERENCES





Cindy Verhoeven



+31 631567875



Poeierstraat 14, 2490 Balen,
Belgium



Cindy.verhoeven@the-sniffers.com



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