1963–2013 concawe 50 years delivering science for Europe

Industry performance over 50 years

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Overview

- Introduction
  - The start of the 60s
  - "Water, water everywhere and not a drop to drink"
  - CONCAWE
- European regulatory environment protecting water
- The current EU refining sector
- Facing the challenges
  - CONCAWE and WSWQMG role
  - Refinery BREF revision – example in progress
  - Scientific Advocacy
  - Publications
- Summary

A few events from 1963

- Rev. Martin Luther King, Jr. makes his "I have a dream" speech
- Philips introduces the audio cassette format for playing music
- Organisation of African Unity established
- President Kennedy assassinated
- Nuclear Test Ban treaty
- First episode of Doctor Who appears on the BBC
- Soviet cosmonaut, Valentina Tereshkova, is the first woman in space
- Britain and France agree to jointly develop Concorde
- A volcanic eruption near Iceland creates a new island, Surtsey
- My wife was born (but don't tell her I told you!)
- **CONCAWE** established by a small group of leading oil companies

Environmental backdrop 1960-1963

- 1960 -- Jacques Cousteau and Prince Rainier III of Monaco oppose French plan to dump radioactive wastes into the Mediterranean Sea.
- 1961 -- International Clean Air Congress held in London.
- 1961 -- World Wildlife Fund founded
- 1962 -- Another London smog; 750 die.
- 1962 -- July 22—"Oil Slick is Shroud for Birds" (Washington Post)
- 1962 -- Silent Spring by Rachel Carson is published
- 1963 -- Multinational agreement to protect Rhine River from pollution (Berne Accord).
- 1963 -- Nuclear Test Ban Treaty between U.S. and U.S.S.R. (Russia) stops above ground tests of nuclear weapons.

The vulnerability of the planet to man's activities is awakened

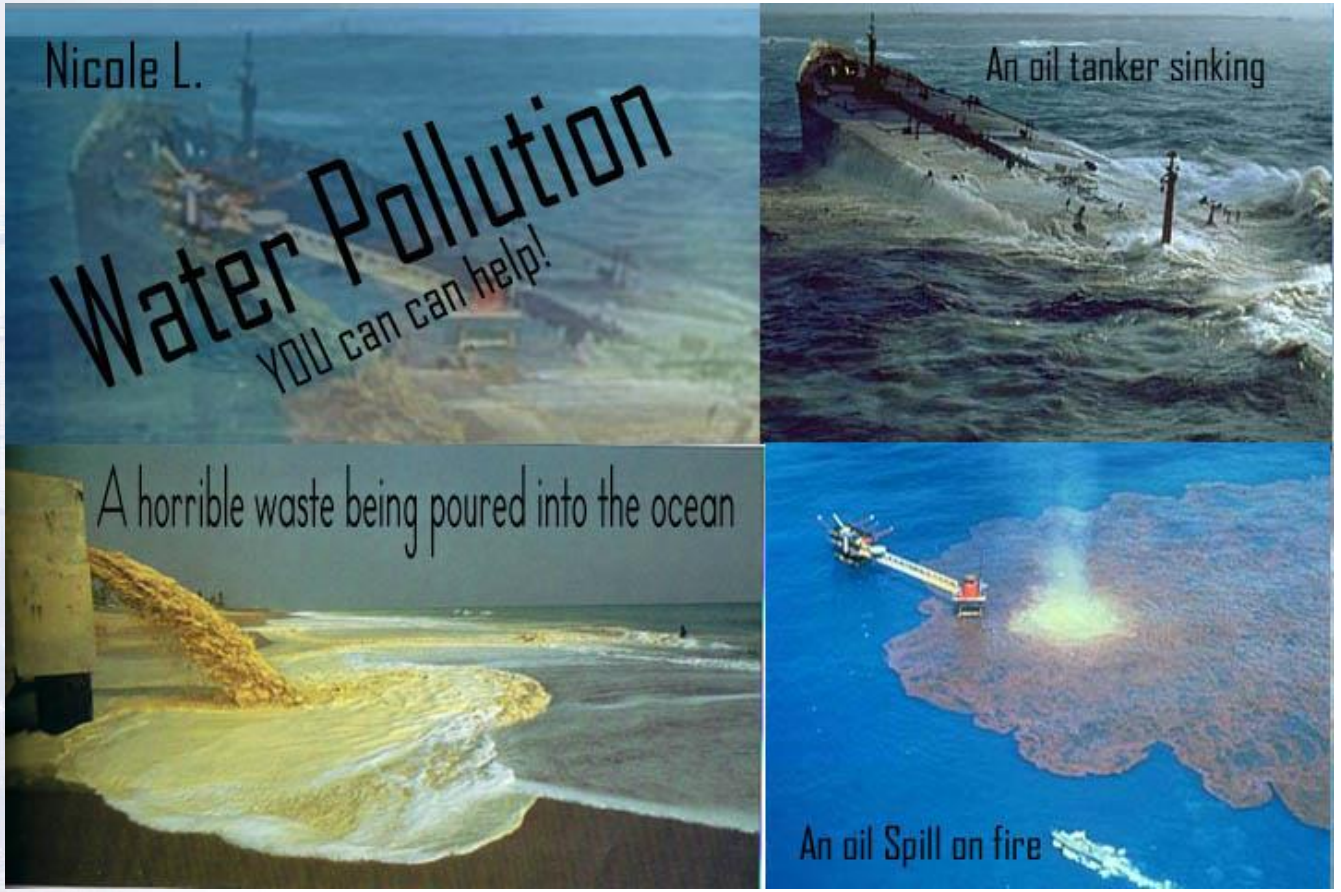
Water, water everywhere

- Water recognised as an essential resource
- Visible pollution no longer tolerated
- Concerns about 'invisible contaminants' awakened by advances in analysis and gas chromatography in particular
- Over the past 50 years water has come progressively higher on the international agenda because of its intimate relationship with both human health and ecosystem development
- Water is a key issue for oil refineries as these use large quantities of water, handling roughly 6 times more water than the quantity of crude-oil processed
- Since it's inception CONCAWE has strived to face the challenges relating to water use and discharge from the downstream oil industry

Water, water everywhere

Not all of these images are from the 1960s

Oil pollution is highly visible and emotive



http://greenplanetethics.com/wordpress/wp-content/uploads/2012/03/Media-Card-Nicole-Water-Pollution-copy.jpg

CONCAWE: Research in Diverse Areas

CONservation of

Clean

Air and

Water in

Europe

- Air Quality
- Water/Soil Quality & Waste
- Safety
- Oil Pipelines
- Automotive Emissions & Fuel Quality
- Refinery Technology Support
- Health Science
- Petroleum Products
- Risk Assessment
- REACH & GHS Implementation

The Oil Companies' European association for health, safety and environment in refining and distribution (Founded in 1963)

CONCAWE

- Established as a European association for completing research on health, safety, and environmental (HS&E) issues of importance to the European oil refining industry

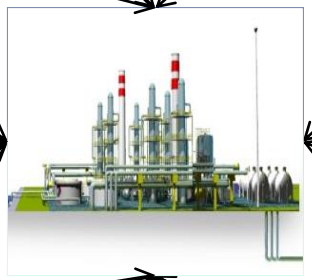
- Objectives (as per statutes):
  - Acquire adequate scientific, economic, technical, and legal information on HS&E issues
  - Improve the understanding of these issues by the industry, authorities, and consumers

- CONCAWE promotes three operating principles:
  - Sound science
  - Cost-effectiveness of technical options
  - Transparency of results

- CONCAWE also assists the advocacy efforts of EUROPIA
  - *EUROPIA represents the European petroleum industry*
  - Data gathering and evaluation, scientific support

europia representing the european petroleum industry

Soil, Water and Waste Legislative Environment



IED
Industrial Emissions Directive

E-PRTR
European Pollutants Release and Transfer Register

Chemical analysis and monitoring of water status Directive

Environmental Quality Standards Directive

Marine Strategy Framework Directive

Waste Incineration Directive

Council Decision on Biodiversity

Water Framework Directive

Waste Framework Directive

Birds Directive

REACH Substances Directive

Habitat Directive

Groundwater Protection Directive

Thematic Soil Strategy

Environmental Liability Directive

Sewage Sludge Application Directive

Suppression/reduction of the emissions of priority dangerous substances

WSWMG

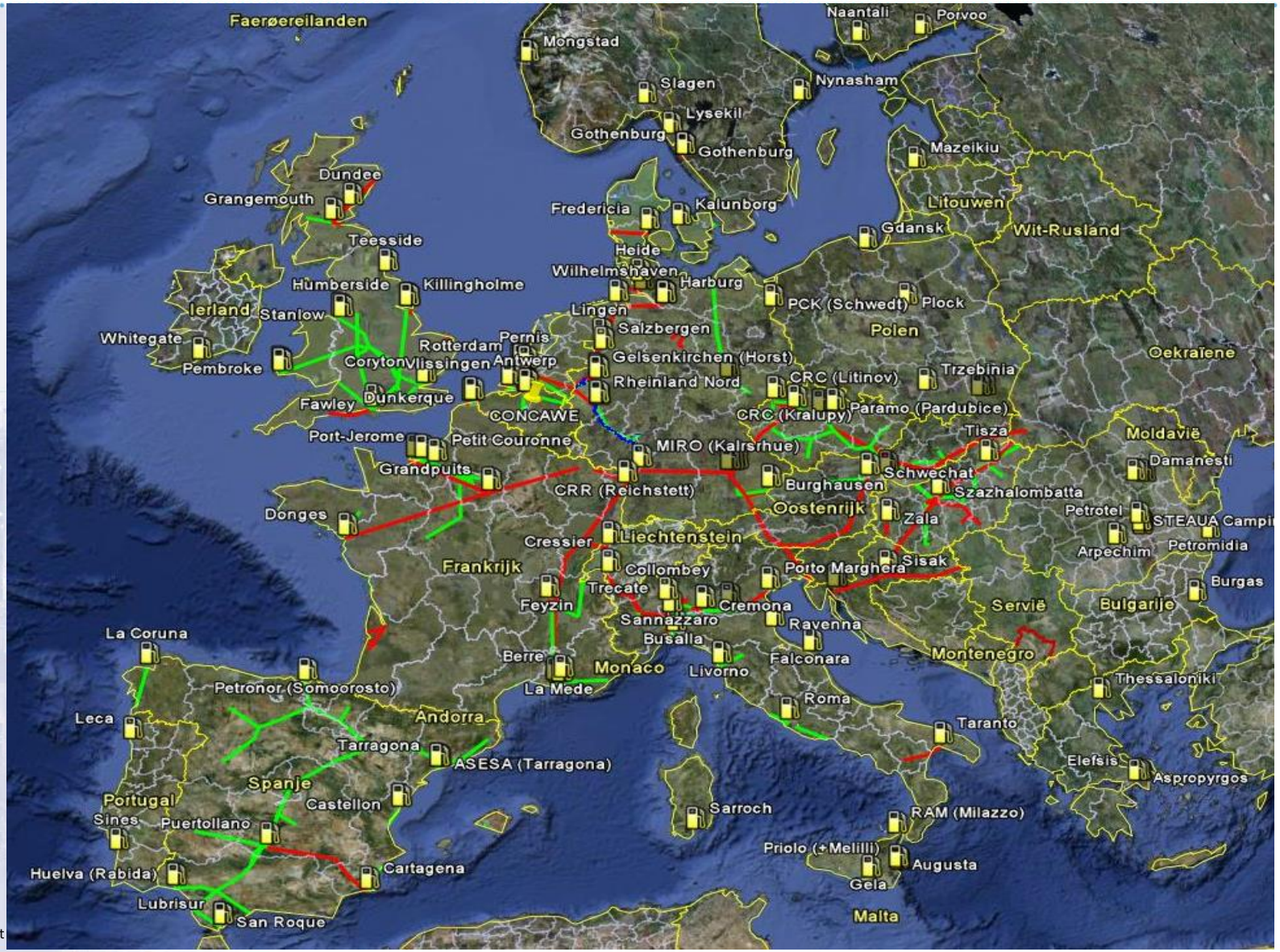
Tiered Environmental protection legislation

- Substances
  - REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals)
    - Registration of Substances and Authorisation of certain use of Substances
    - May restrict certain applications of substances
  - Plant Protection Products & Biocides Regulations
- Emissions
  - Urban Waste Water Treatment Directive
    - Since 1991 and still not completely implemented by the Member States
    - Has no effluent quality and discharge Emission Limit Values
    - In 2010 E-PRTR emitting >50% of the total pollution load (excl. Chloride)
  - Industrial Emissions (IPPC)
    - Since 1996 and already amended 3 times, last update IED (2010/75/EU)
    - IPPC '96 combined the directives 76/494/EEC (water) and 84/360/EEC (air)
- Water Framework Directive (the water safety net)
  - Aims at safeguarding EU's water quality and quantity
  - Has no power to ban substances or their use, only immissions.

The EU-Refining Industry

- In Europe (EU-27+), there are 43 Companies with oil refining capacity of which 42 are CONCAWE Members
- In 2010 these owned and operated 121 locations where crude oil was continuously processed (24/7 operations)
- The total number of people employed in 2011 was over 550,000
  - These are in the Manufacturing and Marketing of Petroleum Products and cover own and contracted staff under operational control
  - These do not include staff employed at retail stations that are franchised (> 150,000 retail stations)
- The EU Refining Industry is a mature sector that started its activities in the late 19th century

European Refineries on Cross Country Pipelines



The EU-Refining Industry

- The crude oil processing capacity is ~750,000 ktonne/annum
  - Capacity used in 2010 ~ 90% (>670 Mtonne products*)
    - Gasoline/Naphtha → ~ 26%
    - Gas Oils, Kerosenes, HFO → ~ 67%
    - Bitumen → ~ 5%
    - Other petroleum products → ~ 2%
  - Water discharges (2008) → 612 (1,112) Mm^3
  - TPH discharge (2010) → 795 tonne (1.3 g/tonne)
    - Sum of treated discharges, corrected for treatment of waste water transfers
  - Final treatment → 3-step-biox: 113 locations (94%)
- The European Refining sector :
  - Refinery installations : 121
    - Nameplate capacity 749,066 kT/year
  - Types of installations (sites with refining activities):
    - Refineries: 89, 543,135 kT/year
    - Combined refinery/chemical: 21, 189,946 kT/Year
    - Speciality plants: 11, 15,985 kT/year

* The amount of prodcuts manufactured comprises ~40 % of the total volume by weight placed on the EU-market by the petrochemical industry (EUROSTAT, 2010)

The current role of the WSWMG

- Identify and steer the activities of its Special Task Forces (STFs) in the following main areas
  - Water Framework Directive implementation
    - Surface water quality and quantity
    - Ground water and Soil quality
    - Ecological and biodiversity impacts
  - Marine Strategy Framework Directive
    - Comparable to WFD but for the Marine environment
  - Refinery sector water use and effluent quality
    - Industrial Emissions Directive
    - European Pollution Release and Transfer Register (the Name and Shame Regulation)
  - Waste Framework Directive implementation
    - Only in relation to operating issues (e.g. Refinery waste, spent catalysts,
    - No product related waste issues (REACH & Marketing → PPMG)

Current WSWMG issue matrix*

Impact on refining				
	High	Thematic strategy on prevention and recycling of waste; Thematic strategy on Soil Protection	QA/QC Directive; Soil Framework Directive	IPPC/IED; Groundwater directive; EQS-Directive; REACH; Water FD; E-PRTR
	Medium	Marine Strategy Framework Directive; Sewage Sludge Directive; Waste FD; Biodiversity (Birds, Habitat & Natura 2000); Climate Change Impact on the WtFD; Flood protection	Water Scacity & Droughts; CLP-regulation; Environmental Liability Directive	
	Low	Waste Incineration directive; Drinkingwater Quality; Bathingwater Quality; Shellfish & Freshwater fish Landfilling of Waste; Shipment of Waste:		
		Low	Medium	High
		Ability to influence		

* To be revised Q2 2013

Industrial Emissions Directive 2010

- In 2010 a revision of the Integrated Pollution Prevention & Control Directive (2010/75/EU) was adopted the key points being that:-
  - The intent is to reduce Industrial Emission by use of Best Available Techniques (BAT) and Achievable Emission Limits (AELs)
  - The status of the BREF-conclusions has changed
    - Before IED BREFs were quidance documents for permitter consideration
    - After 7 January 2013 BREF-conclusions are mandatory for use in operational permitting, including the BAT-AEL-ranges
    - Derogations are allowed, but unlikely to be granted
  - Requires mandatory soil and groundwater baseline report and regular monitoring which will:-
    - Be used to set remedial controls (if required)
    - Will determine the remedial targets upon ceasation of activities towards identified future use of the site

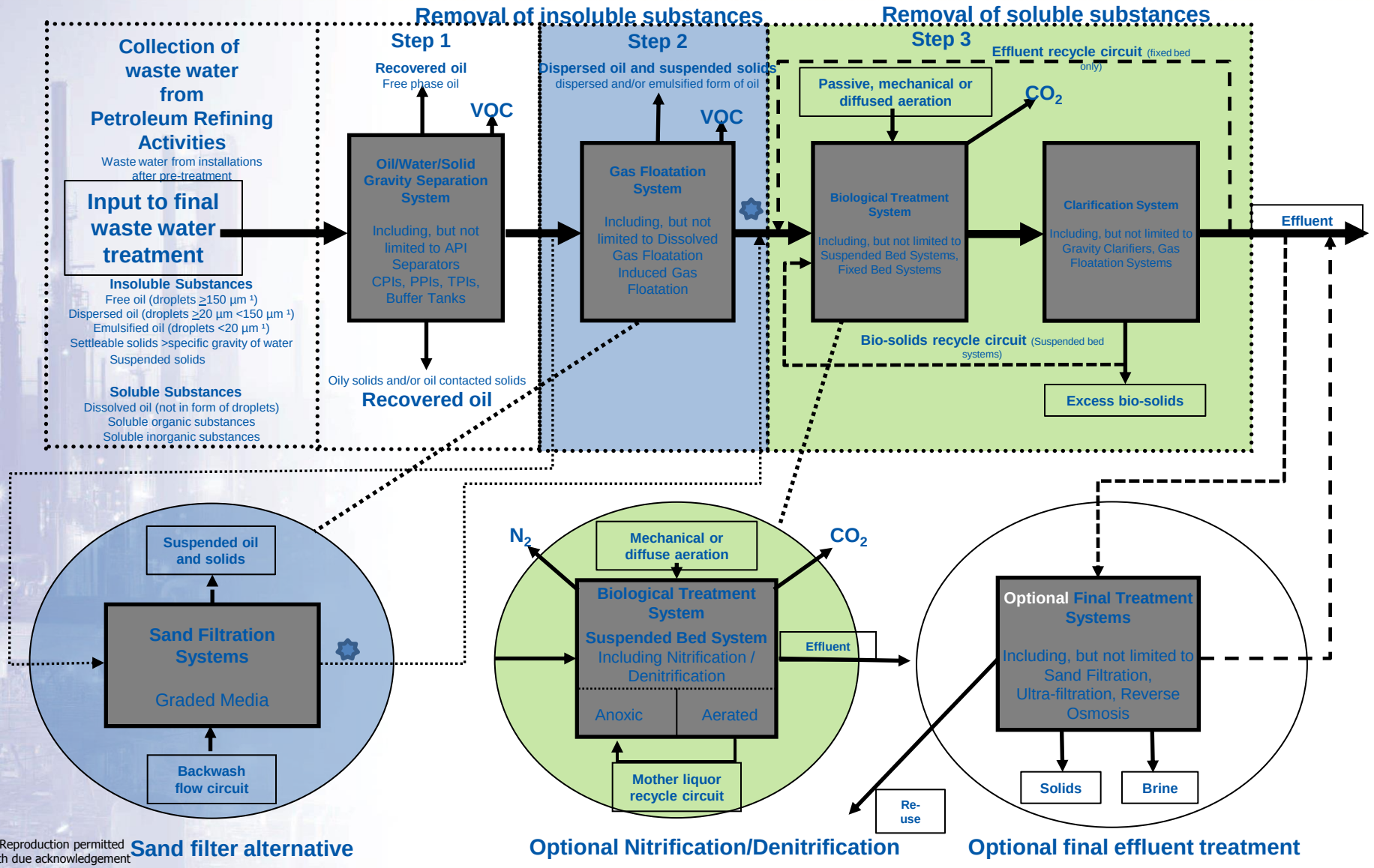
Refinery discharges

- Type of discharges:
  - Process water (Treated or transferred)
  - Cooling water (Treated, monitored or untreated)
    - Once-through (only treated when required) or recycle bleeds (always treated)
  - Domestic water (via in-house WWTP or into public sewer system)
  - Pluvial water (Treated or as received)
  - Other water
    - Ground water remediation projects, etc.
- Monitoring
  - Only known and relevant parameters
    - E-PRTR reportable (Although reporting on estimations are allowed)
    - Parameters specifically mentioned in operating permits
    - Company policy requirements
- For 2010 CONCAWE has analysed refinery discharges on quantity and 50 quality parameters including the WFD-Priority Substances
  - Survey responses were received from 100 refinery installations
  - All data is shared with the REF-BREF Rapporteur and the TWG in BATIS

Refinery BREF Water Discharge BAT

- Refinery waste waters are treated prior to discharge
- All refineries apply techniques that are proven adequate and are existing for many years.
- Upon reviewing the latest survey results and historic performance, CONCAWE is of the opinion that a "Three Staged Treatment Train" is BAT for reducing contaminants discharges
  - The BAT associated ranges are also achieved at installations that do not apply BAT (equivalent performance)
- Where Water discharge treatment BAT is applied the effluent quality data span wide ranges that are determined by:
  - Size and age of the installation
  - Processes implemented at the installation
  - Type of installation (wide product range or speciality plant)
  - Types of crude oil processed
  - Available water resources (e.g. intake concentration > discharge)
- Under certain circumstances it may be required to consider to add a fourth treatment step (e.g. filtration, reverse osmosis)

Advocated Refinery BAT for WWT



WWTP in the EU oil refining sector (2010)

Treatment	Number of installations	Type of biological treatment	Number of installations with specific treatment
3 Stage biological	99	Activated sludge	76
Mechanical	1	Trickling filter	14
Chemical	2	Aerated lagoon	5
Physical	4	Non aerated lagoon	1
API separator	0	Fixed-bed bio-film reactor	1
External WWTP	14	Aerated tank	1
None	0	Other not specified	1
		External not specified	14
Total	120	Total	113

- Data demonstrate that BAT is applied at 94 % of the sites surveyed
- The effluent parameters for the other 6% are with in the BAT-EAL range.

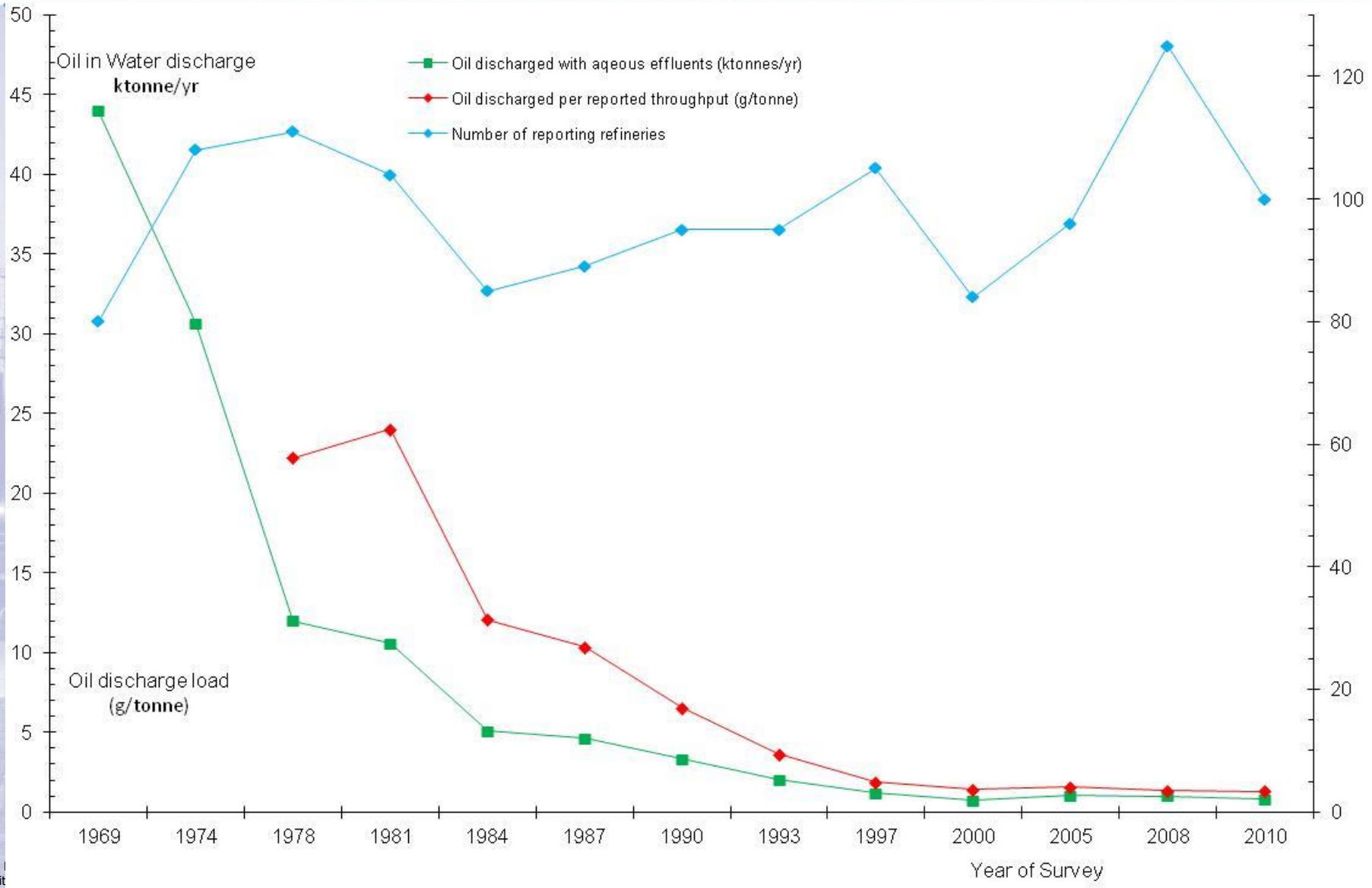
Factors impacting WWTP performance

- In today's business and regulatory environment, the operator running a production installation is faced with the trilemma* that one has to deliver on three important issues:
  1. The reduction of the amount of process water used
  2. The reduction of the contaminant concentration in the final discharge
  3. The reduction of the net contaminant load
- Deliverables 1 & 2 are incompatible, as the reduction of water consumption leads to higher effluent concentrations
  - A reduced contaminant load (3) still might be achievable, when the concentration goes up due to water resource efficiency gains!
- The key point which was emphasised is to not solely focus on concentrations but look at total load because the concentrations in the receiving environment will go down as loads are reduced

TPH a key parameter for refinery effluents

- TPH Total Petroleum Hydrocarbons
  - Core business of the refining sector
  - Anything emitted is a loss
  - Ample knowledge in the sector
  - Data available since 1969
  - TPH data demonstrate that discharge reductions are at the edge of what is achievable with today's technology
  - Further speciation of TPH enables predictions of fate and effects of discharges to be predicted
- Data collated indicates that controlling TPH discharges also manages the majority of the WFD-Priority Substances discharges

concawe Trend in refinery effluent TPH loads (From 1969 - 2010)



CONCAWE INPUT TO BREF REVISION

- CONCAWE has a good understanding of the Refining Sector
- The sector is already operating at the edge of BAT where it concerns Waste Water Discharges
- The comments that CONCAWE made on the water discharges and treatment are fact based
- Waste water treatment BAT is 3-staged treatment train that includes a biological treatment step
  - The associated emissions ranges are achievable with other techniques
- The BAT-AEL-ranges are those that are observed at installations applying this technique
  - A statistical cut-off has no scientific, environmental or economic rationale
  - There is no template standard refinery, which explains the spread in observed discharge concentrations and loads

CONCAWE's role

- CONCAWE has always endeavoured to conduct its activities with objectivity and scientific integrity and uphold the three key principles: sound science, transparency and cost-effectiveness
- CONCAWE recognises that the potential solutions to the complex water related challenges of the 21st century require the combined efforts of many parties
- CONCAWE is thus engaged in a wide range of partnerships and maintains contacts with other industry sector associations and international organisations.
- Over the past 50 years CONCAWE has been recognised as an important and 'trusted' contributor to many organisations relating to water issues
- CONCAWE has been effective by virtue of information and expertise/knowledge supplied from it's Member Companies

WSWMG Scientific 'Advocacy' (2011-2012)

- WSWMG voices the CONCAWE positions at the EU-table
  - Accepted the invitation to become a member of the Strategic Coordination Group of the WFD implementation
  - Participation as key speaker at European Parliament Water Workshop
  - Member of WG-E (PS & PHS) and WG-C (Groundwater)
  - Member of the Expert Group on Environmental Quality Standards (EQS)
  - Member of Chemical Monitoring & Emerging Pollutants project
  - Developed dialogue with Refinery BREF Rapporteur on Water issues
  - Provided input into the Common Waste Water treatment BREF
  - Provided input for the revision of the Monitoring BREF

Over its 50 year history CONCAWE's scientific advocacy role has increased as it has maintained it's core values and increasingly been seen as a trusted partner

Reports to back CONCAWE's credibility

- CONCAWE has published many reports relating to water issues and a few are presented below:-
  - The environmental impact of refinery effluents Report No 5/79
  - Ecological monitoring of aqueous effluents from petroleum refineries Report No 8/82
  - Determination of hydrocarbons in aqueous effluents from the oil industry by infrared analysis Report No 1/84
  - An assessment of acute toxicity testing for the monitoring and control of oil refinery effluents Report No 86/55
  - CONCAWE effluent speciation project Report No 3/10
  - Assessment of refinery effluents and receiving waters using biologically-based effect methods Report No 1/12
  - Trends in oil discharged with aqueous effluents from oil refineries in Europe - 2010 survey data Report No 6/12

These demonstrate that CONCAWE was looking at many issues (e.g. biological effects monitoring) ahead of developing regulations

External Presentations/Publications

- Presentations will be made at the SETAC Europe 23rd Annual Meeting in Glasgow, Scotland (12-16 May, 2013)
  - Assessing petrochemical effluents using mesocosms –
    - Poster 1 - Understanding the biological responses
    - Poster 2 - Designing large scale experiments
    - Poster 3 - Comparison of predicted, laboratory and mesocosm measured toxicity of petrochemical effluents
- These presentations provide opportunities to discuss scientific issues with academics, regulators and other industry scientists
- The intention is that these presentations will be published in peer-reviewed journals
- During it's 50 year history much of the research undertaken on water, soil and waste issues has been published which helps provide robust indicators of the oil refining sector performance

Summary

- Over the past 50 years
  - Member companies have delivered by improving water management and treatment leading to significant reductions in water use and discharges
  - The challenges relating to water use have changed and new metrics have been used to assess discharges and water quality
  - CONCAWE has collated data and managed research programmes to meet these new challenges
  - A number of reports and publications have been produced which enhance CONCAWE's credibility and reputation
- CONCAWE data indicate that the impact of the modern oil refining sector on Europe's surface and groundwater bodies is minimal
- However, it is an ever changing world and water remains a precious resource and new challenges are constantly emerging