

PNV 3511

**Poluição dos Oceanos: Avaliação,
Controle e Prevenção**

AULA 4

30 de agosto de 2018

CUSTO ASSOCIADO À POLUIÇÃO

Algumas questões apresentadas anteriormente remetem a aspectos econômicos ou políticos e talvez não tenham qq cunho científico.

Embora existam custos envolvidos, estes aumentam rapidamente a medida que se quer erradicar uma fonte poluente

CUSTO ASSOCIADO À POLUIÇÃO

Exemplo: Remoção de particulados emitidos por uma termo elétrica:

90% de remoção adiciona 10 % no custo de capital

95% de remoção adiciona de 20 a 30%

99 % de remoção dobra o custo de capital da unidade

CUSTO ASSOCIADO À POLUIÇÃO

Exemplo: Usina de Açúcar com 2700 ton/dia de esmague, poderia despejar material orgânico num rio, que exige uma carga de Oxigênio para sua degradação bacteriana. (BOD)

Um sistema de tratamento antes do despejo custaria:

30% de remoção – USD 1,0 por kg de BOD

65% de remoção – USD 15 por kg de BOD

90% de remoção – USD 40 por kg de BOD

CUSTO ASSOCIADO À POLUIÇÃO

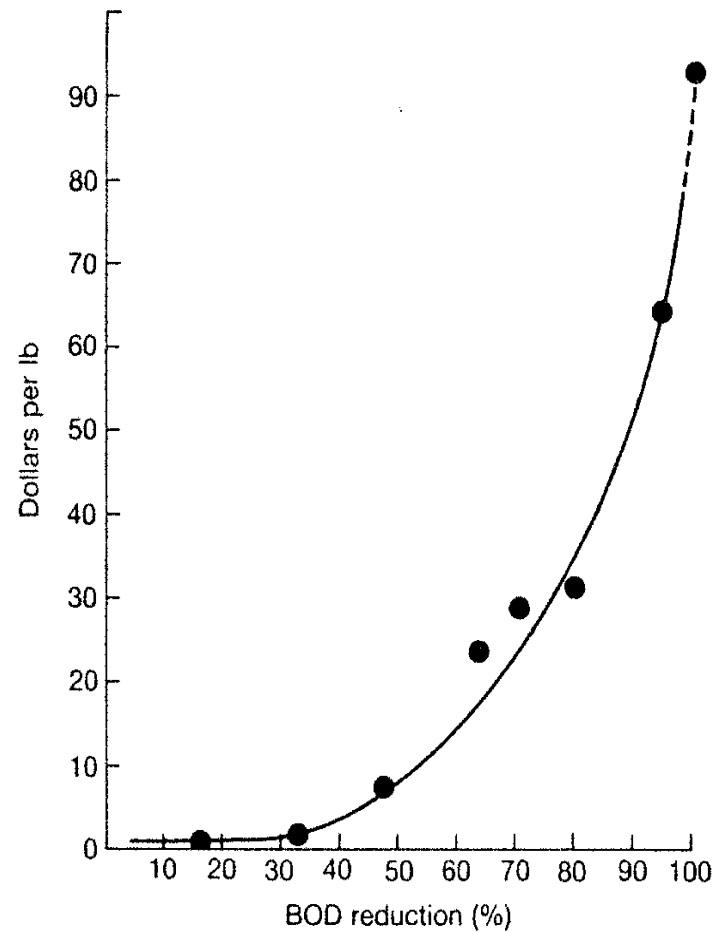


Fig. 1.1. Cost of reducing the organic content (as measured by BOD) of the wastes from a sugar beet factory.

CUSTO ASSOCIADO À POLUIÇÃO

Assim, reduzir poluição pode ser extremamente caro. Pergunta-se, portanto:

Quanto limpo o empreendimento quer ser?

Quanto custa ser o limpo planejado?

Quantos benefícios se tem com esse nível de “ser limpo”?

DERRAMAMENTO DE ÓLEO E LIMPEZA

5 milhões de toneladas de petróleo são introduzidas anualmente nos oceanos

Table 3.1. Estimated world input of petroleum hydrocarbons to the sea (millions of tonnes per year)

	Oil industry	Other	Total
<i>Transportation</i>			
Tanker operations	0.60		
Tanker accidents	0.30		
Dry docking	0.25	→ ?	
Other shipping operations		0.12	
Other shipping accidents		0.10	
	1.15	0.22	1.37
<i>Fixed installations</i>			
Offshore oil production	0.06		
Coastal oil refineries	0.06		
Terminal loading	0.001		
	0.12		0.12
<i>Other sources</i>			
Industrial waste		0.15	
Municipal waste		0.30	
Urban run-off		0.40	
River run-off		1.40	
Atmospheric fall-out		0.60	
Natural seeps		0.60	
		3.45	3.45
	1.27	3.67	4.94
<i>Biosynthesis of hydrocarbons</i>			
Production by marine phytoplankton		26 000	
Atmospheric fall-out		100–4 000	

DERRAMAMENTO DE ÓLEO E LIMPEZA

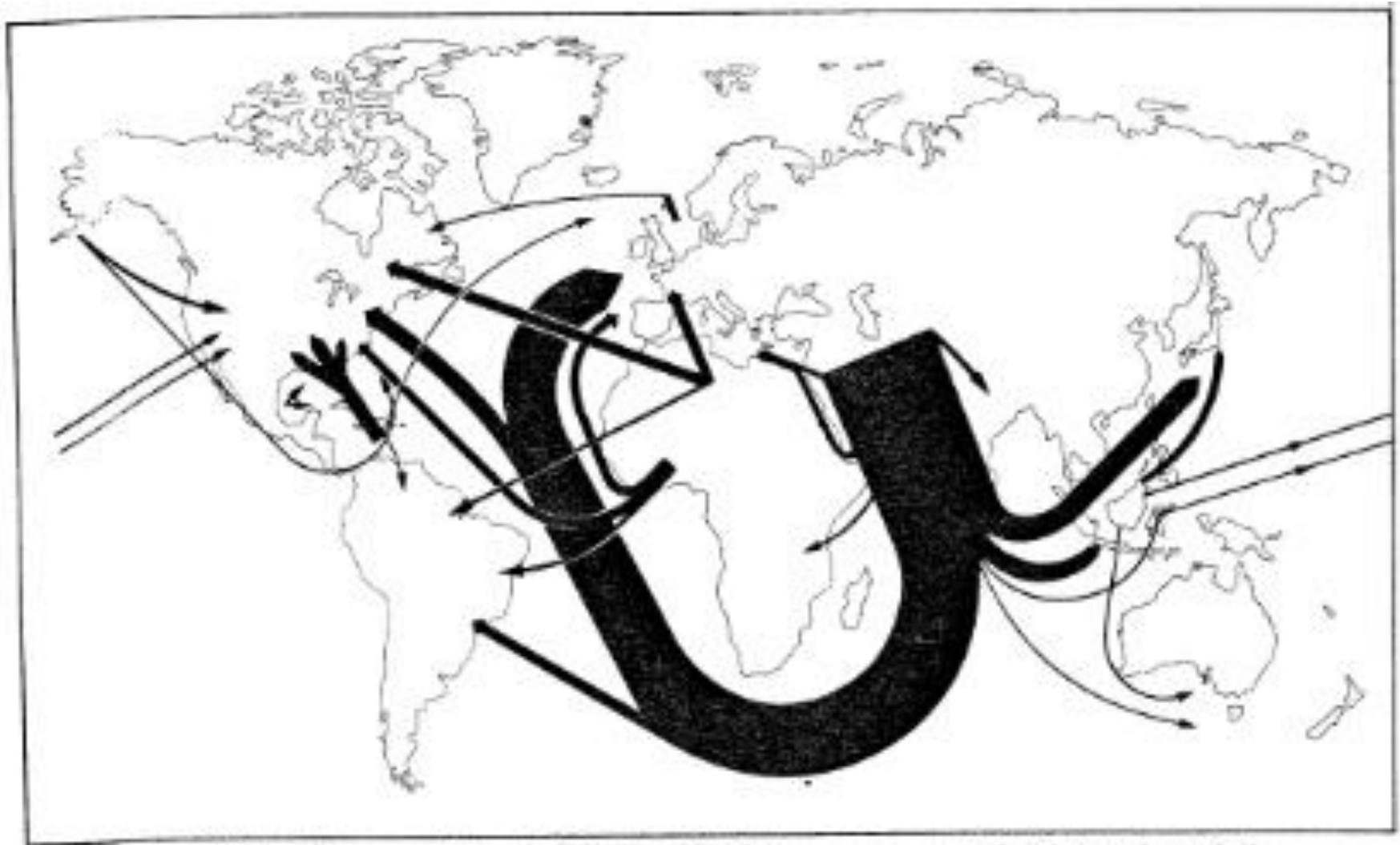
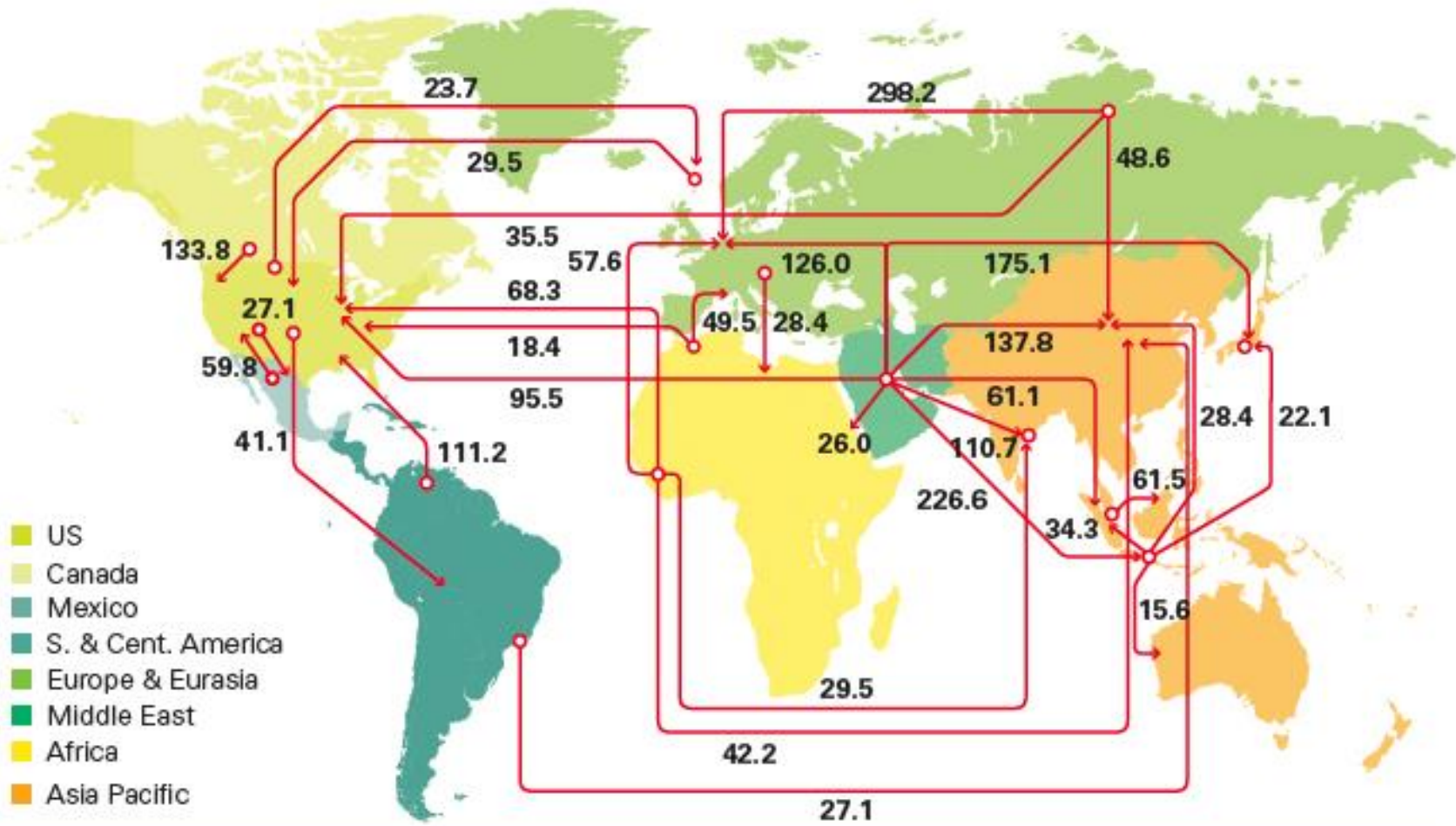


Fig. 3.1. Major oil movements at sea in 1979. The width of the arrows represents the relative volume of oil.

DERRAMAMENTO DE ÓLEO E LIMPEZA

Major trade movements 2011
Trade flows worldwide (million tonnes)



DERRAMAMENTO DE ÓLEO E LIMPEZA

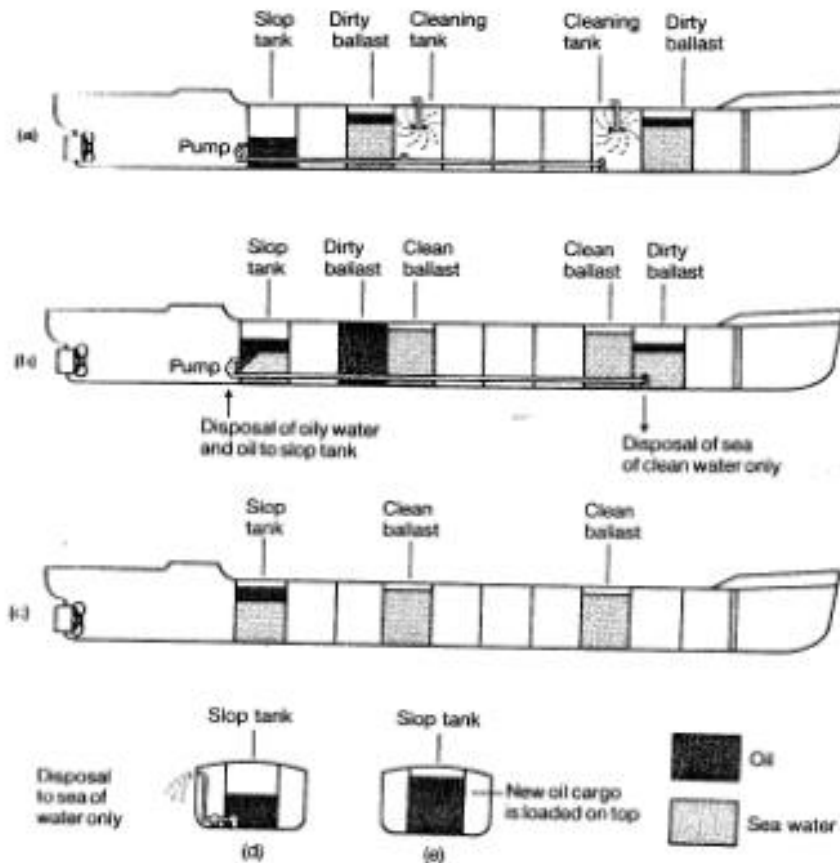


Fig. 3.2. Load on top: (a) empty tanks are cleaned by water jet and the washings transferred to the slop tanks, (b) oil floats to the top in tanks containing dirty ballast; the water is discharged to sea and oil transferred to the slop tank, (c) eventually the ship carries only clean ballast and oil in the slop tank floats to the surface, (d) underlying water is pumped out and (e) new cargo is loaded on top of the oil remaining in the slop tank.

DERRAMAMENTO DE ÓLEO E LIMPEZA

Introdução de Óleo nos Oceanos: Fontes

- Operação dos navios petroleiros
- Acidentes com navios petroleiros
- Operação de outros tipos de navios
- Acidentes com outros tipos de navios
- Docagem
- Produção Offshore
- Refinarias na Costa
- Carregamento e Descarregamento em Terminais
- Descarga Industriais e urbanas
- Chuvas
- Fendas
- Bio-síntese

Atraem um público grande;

É visível;

Reduz imediatamente o uso de praias;

As imagens chocam!

**O acidentes podem ter de sérias
proporções:**

**1967 – Torrey Cannon – 40.000 t na costa
inglesa**

**1977- campo offshore no Mar do Norte
explode – 25.000**

1978 - Amoco Cadiz - costa Inglesa

1979 - Ixtoc I Campeche bay Costa

Mexicana explode. 8 meses – 350.000 t

DERRAMAMENTO DE ÓLEO E LIMPEZA

<http://www.youtube.com/watch?v=pcgWNtY-f54>

<http://www.youtube.com/watch?v=1AG9RLSfZVk>

DERRAMAMENTO DE ÓLEO E LIMPEZA



Rig:	Ekofisk Bravo Platform
Date:	22 April 1977
Location:	Ekofisk Field, Norwegian Continental Shelf
Operator:	Phillips Petroleum Company

Introduction

The Ekofisk field was discovered in 1969, with production coming on-stream in 1971, and the field has since been extensively developed. The Ekofisk Bravo platform is situated to the north of the Ekofisk field and is one of two wellhead production facilities at Ekofisk. On 22 April 1977, it was the location of a blowout and North Sea's biggest oil spill.

DERRAMAMENTO DE ÓLEO E LIMPEZA

Platform Blowout

The Ekofisk B blowout occurred during a workover on the B-14 production well, when about 10,000 feet of production tubing was being pulled. The production christmas tree valve stack had been removed prior to the job and the BOP had not yet been installed. The well then kicked and an incorrectly installed downhole safety valve failed. This resulted in the well blowing out with an uncontrolled release of oil and gas. The personnel were evacuated without injury via lifeboats and were picked up by a supply vessel.

The initial flow was estimated at 28,000 bpd with a calculated total release of 202,380 bbls. Up to 30 to 40% of the oil was thought to have evaporated after its initial release and the Norwegian Petroleum Directorate reported a total spill estimate between 80,000 bbls and 126,000 bbls.

The well was capped after seven days on 30 April 1977. Rough seas and higher than average air temperatures aided the break up of much of the oil. Later investigations reported no significant environmental damage and no shoreline pollution. There was also no significant damage reported to the platform.

The official inquiry into the blowout determined that human errors were the major factor which led to the mechanical failure of the safety valve. These errors included faults in the installation documentation and equipment identification and misjudgements, improper planning and improper well control. The blowout was significant because it was the first major North Sea oil spill. Also significant was that the ignition of the oil and gas was avoided and that there were no fatalities during the evacuation.

DERRAMAMENTO DE ÓLEO E LIMPEZA

Amoco Cadiz



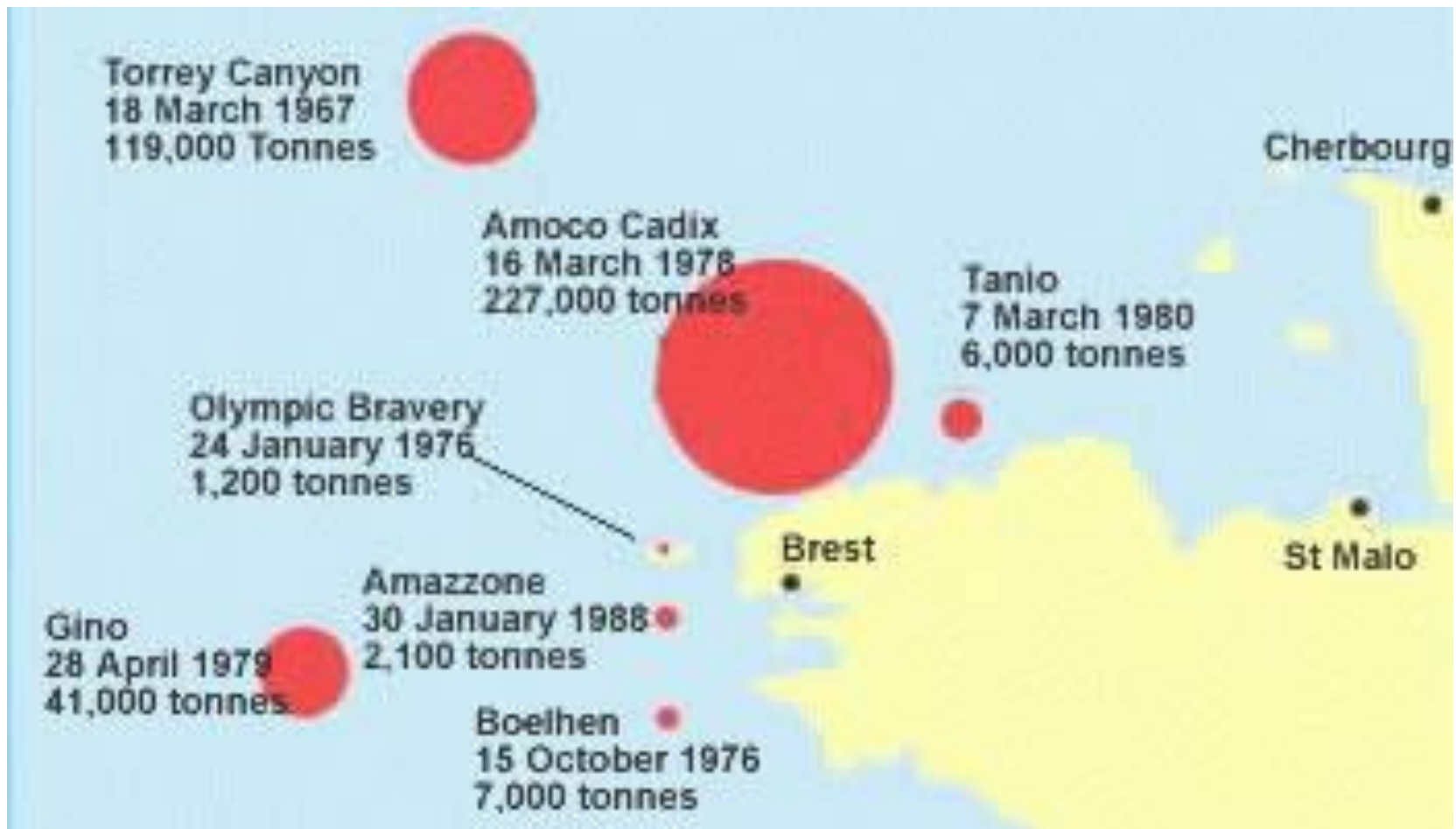
DERRAMAMENTO DE ÓLEO E LIMPEZA

Amoco Cadiz



DERRAMAMENTO DE ÓLEO E LIMPEZA

Amoco Cadiz versus outros acidentes



Amoco Cadiz

<http://www.youtube.com/watch?v=LcXzivdHaYk>

DERRAMAMENTO DE ÓLEO E LIMPEZA

IXTOC I OIL SPILL — JUNE 3, 1979 — BAY OF CAMPECHE

Spill Data

The spill began on June 3, 1979 and was finally contained on March 23, 1980

The spill was the largest offshore oil spill in history as 138 million gallons flowed into the Gulf of Mexico.¹

Oil spilled at a rate of 10,000 to 30,000 barrels per day (420,000 to 1,260,000 gallons per day).²

By mid-June a large oil slick covered more than 3,000 square kilometers.³

A blowout at a exploratory well in 50 meters of water caused the 290-day long spill.⁴

The platform caught fire and sank into the wellhead area, thwarting early attempts to control the blowout.⁵

DERRAMAMENTO DE ÓLEO E LIMPEZA

IXTOC I OIL SPILL — JUNE 3, 1979 — BAY OF CAMPECHE

Cleanup Efforts

Planes dropped the chemical dispersant Corexit 9527 on the oil, treating 1,100 square miles of the slick.⁶

Dispersants were not used in U.S. waters because of their inability to treat weathered oil.⁷

PEMEX, Mexico's government-owned oil company responsible for the spill, first pumped mud into the well to reduce the flow before pumping steel, iron and lead balls to further slow the flow.⁸

Two relief wells were also drilled.⁹

Tropical storm activity, including Hurricane Henri hampered cleanup operations.¹⁰

Ecological Impacts

Over 800,000 barrels of oil sank to the bottom of the Gulf.¹¹

Over 200,000 barrels of oil washed ashore on Mexican beaches.¹²

71,500 barrels of oil (3,003,000 gallons) impacted 162 miles of U.S. beaches.¹³

Over 10,000 cubic yards of oiled material were removed from U.S. beaches.¹⁴

1,421 birds, including herons, egrets and terns, were found with oiled feathers or feet.¹⁵

Approximately 10,000 endangered Kemp Ridley turtles were removed from nesting sites in Mexico to avoid possible contamination by oil.¹⁶

Crab populations, particularly the ghost crab, suffered severe population losses in Mexico.¹⁷

PESQUISA EM AULA

EXXON VALDEZ

Navio PRESTIGE

PLATAFORMA BP no Golfo do México

PLATAFORMA P-36

Objetivos:

- **Causas**
- **Zona antigida, população, economia prejudicada, meio ambiente e etc**
- **Quantidade derramada, Quantidade recuperada, quantidade dispersada**
- **Custos (da operação e de indenização)**
- **Recursos e Tecnoclogia Utilizados (destacar os navios)**
- **Pessoal utilizado**
- **Tempo de operação**
- **Tempo de Restauração**