

IWWT 05

The Exchange, Express Park, Bridgwater, Thursday 12th May 2005

Playing the Mogden Game

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PIE International Limited
– *your partners in the environment*

Environmental Pressures



- **Public**
 - **NIMBY Syndrome (BANANA, CATNEP)**
- **Legislative**
 - **EU Directives (IPPC, Waste Regs)**
 - **UK Environment Agency**
Water Companies
- **Markets**
 - **ISO 14001 (Environmental Management Systems)**

Problems



The Right Approach



- **Waste Minimisation**
- **Define the Problem**
 - **Waste Audit**
- **Choose the Route**
- **Select Treatment Option**
- **Problem Solution**

Cost

A purple curved arrow starts from the bottom left and points towards the top right, indicating a relationship between 'Cost' and 'Choose the Route'.

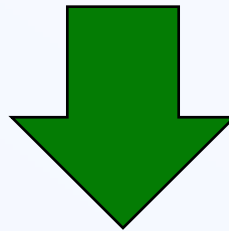
Technology

A purple curved arrow starts from the bottom right and points towards the top left, indicating a relationship between 'Technology' and 'Choose the Route'.

Waste Minimisation



- **Reduction in Raw Material Use**
- **Reuse of Intermediates**
- **Recycling**
- **Reduction in Product Wastage**



Improved Process Efficiency

Define the Problem...

Waste Audit - **Site Study**



- **Stream Identification**
- **Effluent Analysis**
- **Sampling**
 - **Flow Proportional**
 - **Time Proportional**
 - **Spot**
- **Verification**



Waste Audit - Document Review



- **Site Records**
- **IPPC / EA / Water Charges**
- **Site Interviews**
- **Raw Materials Inventory**
- **Waste/Effluent Inventory**
pH, SS, COD, Soluble COD,
BOD, Nutrients etc.



Discharge Route



- **Controlled Waters** **BOD 20, SS 30** **2 stages ?**
- **Land Application** **BOD 300** **2 stages ?**
- **Sewer Discharge** **COD 3,000 to 5,000** **1 stage ?**

units = mg/l

Discharge to Water



- **Consent (typically BOD = 20mg/l, SS = 30mg/l)**
- **Highest Capital Investment**
- **Monitoring Charges**
 - **Volume**
 - **Contents**
 - **Receiving Waters**
 - **Financial Factor**

Discharge to Land



- **Agricultural Benefit**
- **Significant Capital Investment**
- **Landfill Charges (Tax / New Directive)**
- **Regulation**



Discharge to Sewer



- **Consent (3,000 - 5,000 mg COD/l)**
- **Variable Capital Investment**
- **Mogden Charges**
- **Direct Toxicity Assessment**

The Mogden Formula

www.mogden.org.uk



$$C = R + V + Vb + \frac{B(O_t)}{(O_s)} + \frac{S(S_t)}{(S_s)}$$

C - Charge p/m³

R - Reception Charge

V - Volume Charge

Vb - Volume Charge for Biological Treatment

B - Charge for Biological Treatment

S - Charge for Solids Treatment

O_t - BOD of Effluent, O_s - BOD of Sewage

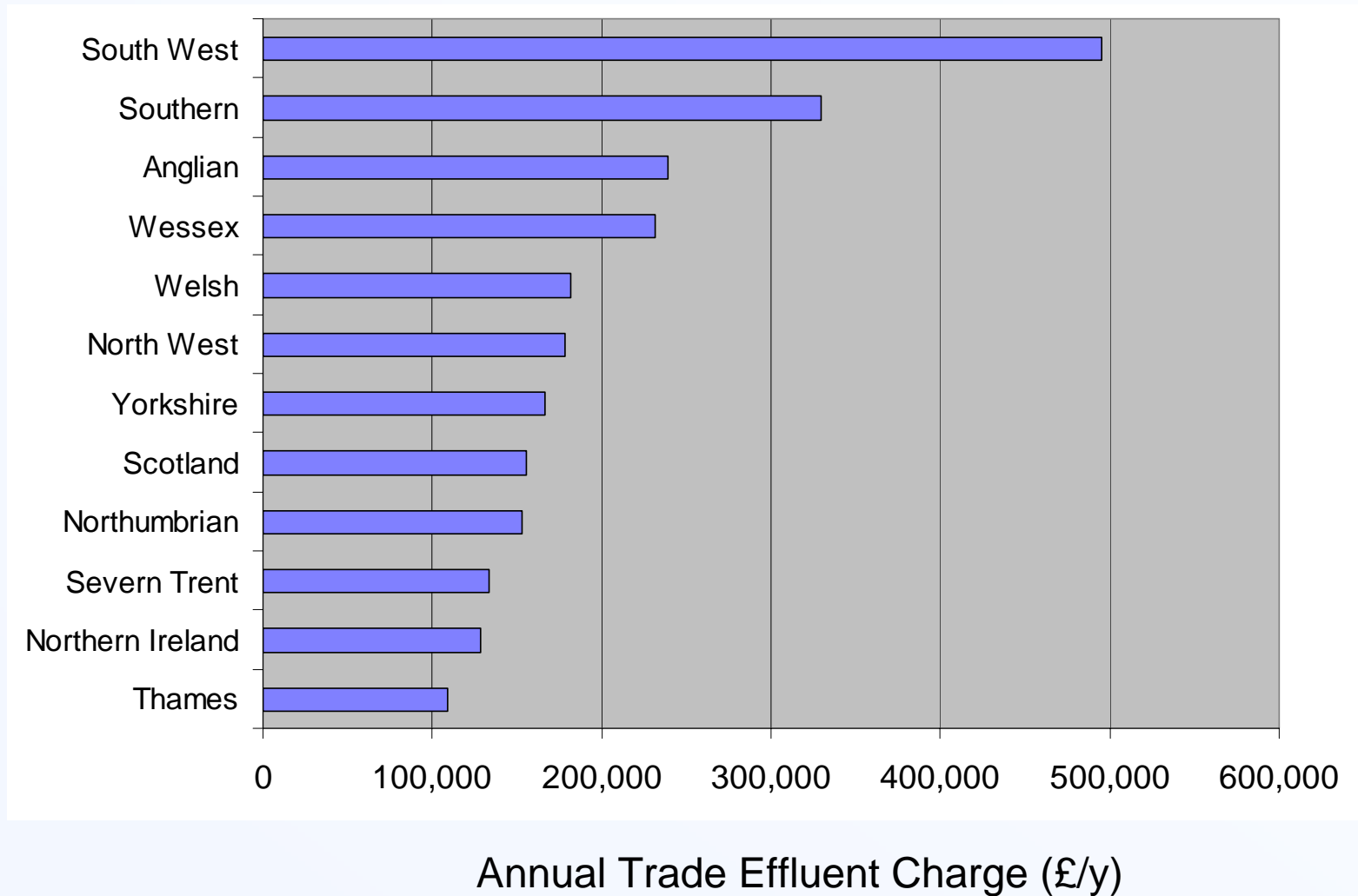
S_t - SS of Effluent, S_s - SS of Sewage



Mogden Charges (2005/06)

1 tonne COD/d

(Flow = 200m³/d, COD=5,000 mg/l, SS=1,000mg/l)



Recent Changes to Mogden



Mogden Formula for 2005/6								
	Flow (m3/y)	Os (mg/l)	Ss (mg/l)	R (p/m3)	V (p/m3)	VB (p/m3)	B (p/m3)	S (p/m3)
Anglian (Green)	0-500	423	403	17.45	27.30	4.78	22.88	19.38
Anglian (Orange)	500-5,000	423	403	15.98	25.02	4.87	20.97	17.77
Anglian (Blue)	5,000-50,0	423	403	15.49	24.24	4.69	20.32	17.20
Anglian (Purple)	>50,000	423	403	11.97	18.74	3.62	15.71	13.29
Scotland		350	250	12.88	8.59	0.00	11.48	7.02

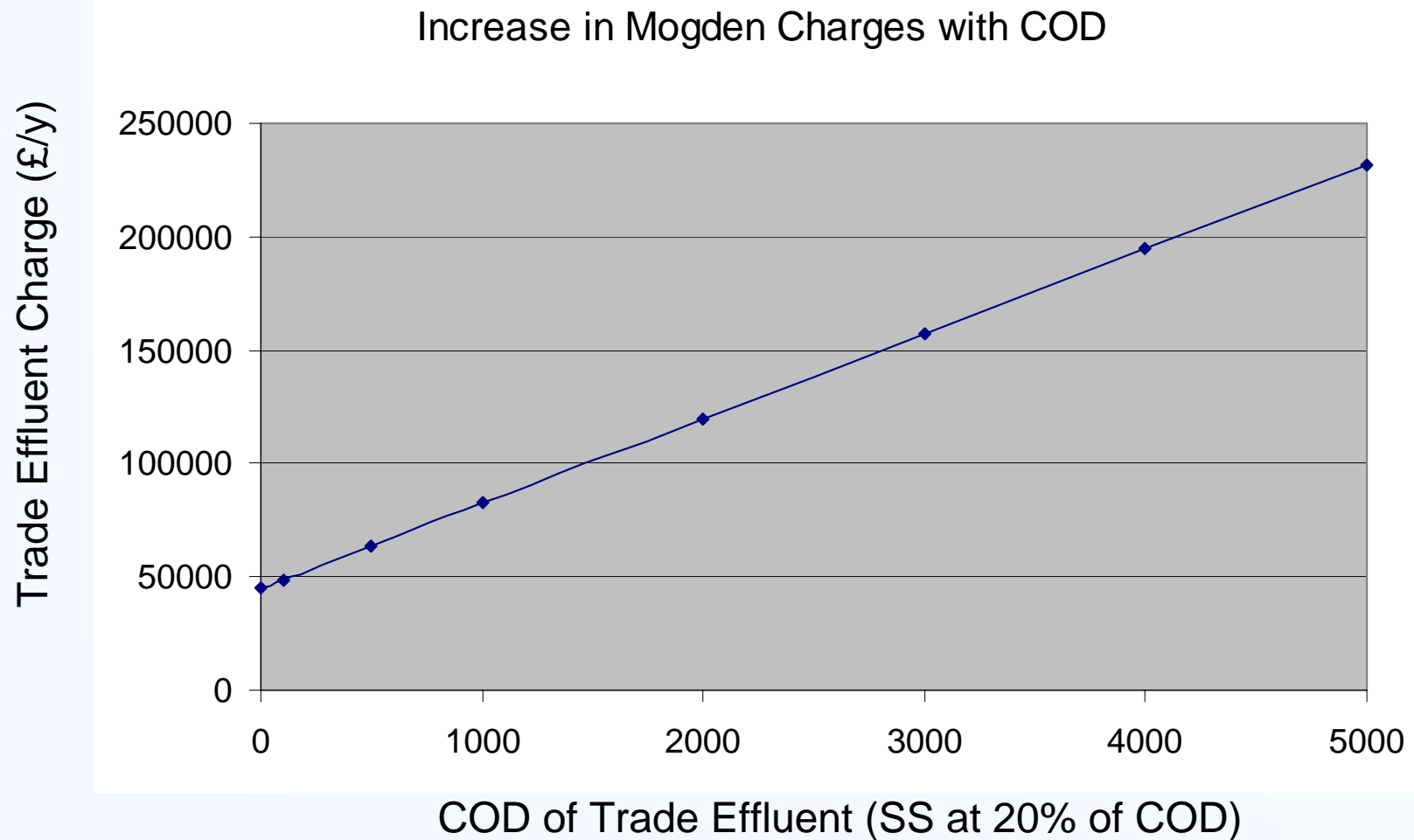
Increases

RPI 1.1.2000 – 1.1.2005 = 7.605%, excluding housing



Region	'05-'06	'00-'01	(%)
Thames	109,317	102,030	7.1
Northern Ireland	128,117		
Severn Trent	133,559	101,641	31.4
Northumbrian	152,628	169,048	-9.7
Scotland	155,892		
Yorkshire	166,628	129,393	28.8
North West	178,455	129,656	37.6
Welsh	182,096	145,526	25.1
Wessex	231,964	163,127	42.2
Anglian	238,921	211,679	12.9
Southern	329,238	244,176	34.8
South West	495,407	387,052	28.0

Playing the Mogden Game



Playing the Mogden Game



Mogden Formula Charges 2005-6

Mogden Formula Calculator 2005-2006

Choose your Water PLC: Anglia Water

Enter the Volume/COD/SS of your effluent:

Volume: 200 m³/d

COD: 5000 mg/l

SS: 1000 mg/l

Annual Charge is: £ 168,800

$$C = R + V + V_b + B \left(\frac{O_t}{O_s} \right) + S \left(\frac{S_t}{S_s} \right)$$

R = 10.94
 V = 17.13
 V_b = 3.31
 B = 13.44
 S = 11.61
 O_t = 5,000
 O_s = 396
 S_t = 1,000
 S_s = 385

C = total charge for trade effluent treatment (p/m³)
 R = reception and conveyance charge (p/m³)
 V = volumetric and primary treatment cost (p/m³)
 V_b = additional charge where there is biological treatment (p/m³)
 B = biological oxidation cost of settled sewage (p/m³)
 S = treatment and disposal costs of primary sludges (p/m³)
 O_t = COD of effluent after 1hr quiescent settlement at pH 7 (mg/l)
 O_s = COD of crude sewage after 1hr quiescent settlement (mg/l)
 S_t = total suspended solids of the trade effluent at pH 7 (mg/l)
 S_s = the total suspended solids of crude sewage (mg/l)

Note: Anglia Water has implemented a complex set of Mogden Charges which are colour coded and vary depending on the flow rate. There are four separate flow regimes, each having separate indicies:

Technology



- **IPPC**
- **BAT**
- **Operation**
- **Regulation**

The End