

Two years ago, when BSO/Origin published its first set of environmental accounts, the figures were based on uncertain rather than certain factors. They were still published, however, with the aim of identifying a shortcoming in the presentation by the average company of its financial figures. Although the calculation methods used to draw up this year's environmental accounts have become more sophisticated, they are still far from accurate. The figures offer a mere indication of the scale of the environmental impact and, in comparison with the previous years, show an improving trend.

It was expected that the publication of a set of environmental accounts would have a positive effect within BSO/Origin in that many of the staff would embark on their own process of consciousness-raising as a result of being asked once a year how much paper and energy they had used and how many miles they had travelled in their cars. In order to find out how well-founded this expectation was, the cells were given an additional questionnaire this year with specific questions concerning measures taken to alleviate the burden on the environment.

#### *The human factor*

The environmental accounts are no more than a numerical reflection of the

results of various activities. Unfortunately, the environmental contribution made by the staff is insufficiently reflected in these figures. The reason is that the transportation factor dominates all other forms of pollution. Unfortunately, this, the major source of environmental pollution, can only be tackled to a certain degree: after all, transportation has an important place in the company's activities and in its working conditions.

Nevertheless, BSO/Origin will not resign itself to this conclusion. It is actively involved in cutting back on the use of cars. Moreover, there are some ten cells which have created the possibility of working from home with the aim of reducing commuter traffic.

There are various other possibilities for making a daily contribution in practice to resolving the environmental issue. A survey held among the BSO/Origin cells shows that efforts to this end are being made on various fronts. 50 cells have completed the survey, which consisted of 29 yes/no questions concerning 1991, 1992 and the forecasts for 1993. The survey was set up in such a way as to be able to deduce from the answers the extent to which environmental measures were consciously being carried out by the various cells. The questions were subdivided into a number of categories: general corporate issues, energy, use of materials, waste

and emissions and transportation. In comparison with 1991, the average number of positive answers rose from 9 to 13; the 1993 forecasts actually produced 14 positive answers.

Although the adjustments concerned are quite simple in some cases, the growing scale of environmentally conscious actions is a sign that a change in attitude is under way. One striking fact is that a positive trend can be observed from all four corners of the world and in all areas. Double-sided copying and using non-chlorinated or recycled paper, for example, are showing a strong improving trend, as are the use of alcohol- or water-based markers and correction fluid. In the evenings and at weekends, the central heating is being turned down more and more, while in hot countries such as Brazil, the air-conditioning system is switched off outside office hours.

Of course these are only slight improvements, but the answers still give a fairly accurate picture of the things that are uppermost in the minds of a lot of people.

The number of cells engaged in an environmental protection program, for example, rose in 1992 from 2 to 9. In addition, 15 cells have committed themselves to implementing such a program in 1993.

The highest score was obtained in

obvious areas such as using mugs instead of plastic cups (34 positive answers, compared with 25 in 1991). The use of sugar and coffee-whitener from jars instead of disposable sachets is also showing a strong increase (21 instead of 13; this number is expected to rise to 29 in 1993).

As a result of BSO/Origin's organizational structure, each cell is responsible for its own environmental measures. Environmental committees have been set up spontaneously in a number of cells.

What is striking is the worldwide nature of the efforts. An important factor in this respect is undoubtedly the strong environmental awareness in a number of countries, which explains the relatively positive scores for The Netherlands (/AT Eindhoven, /IS Dordrecht and /Management Support Breda in particular), Luxemburg, Switzerland and Taiwan. An impressive result was achieved by the São Paulo, Brazil cell, which returned a positive score on many of the issues.

Relatively small changes in attitude, too, are reflected in the environmental accounts. The 8 per cent decrease in environmental impact related to energy consumption in particular is entirely the result of individual efforts.

### *Result*

It is the purpose of the environmental accounting to quantify the damage caused to the environment in financial terms - in itself a difficult task, as damage to any eco-system cannot easily be expressed in terms of money. The calculation method used seeks to determine the theoretical cost of reversing the damage incurred back to a level where the natural ecosystem is able to eliminate the residual effects. This amount forms the basis of the 'net value extracted'.

During the year, the trend shown in the figures for 1991 continued. The net value extracted per employee decreased to Dfl. 866 (1991: Dfl. 954; 1990: Dfl. 986). Notwithstanding the increase in the number of staff, this has even resulted in an overall decrease in absolute terms of 4 per cent (from Dfl. 3.4 in 1991 to Dfl. 3.2 million).

The main contributing factor to this decrease is car traffic, which showed a 3 per cent reduction in environmental impact compared with 1991. The environmental impact caused by car traffic decreased without a specific policy change. Fewer miles were travelled (an average decrease of 12 per cent per employee and an overall decrease in absolute terms of 10 per cent), in addition to which the type of car also had an effect.

An explanation for the fact that the decrease has remained limited to (a mere) 3 per cent is the recalculation of the emissions of cars with catalytic converters (particularly those running on LPG). On the basis of recent figures it has been established that the average return of catalytic converters fitted to LPG cars is lower than was assumed before. The comparative figures have not been adjusted to these higher emissions.

*General*

BSO/Origin's environmental accounts seek to estimate the impact on the environment of the company's operations. In some cases, no exact values can be given in this respect. This is particularly true for emissions caused, for example, by cars, airplanes and power stations. Moreover the questionnaires sent to all of BSO/Origin's 80 cells were not always completed fully or in exactly the same way. The missing data were completed by extrapolation.

A set of environmental accounts tries to arrive at an estimation of the cost of the environmental impact caused by the company. Offsetting this impact, expressed in financial terms, against are the environmental expenditure, which takes the form of environmental levies, taxes and payments made to private waste disposal companies. In the year under review, these expenses rose by 9.6 per cent (1991: 7.0 per cent).

The cost of the environmental impact less the environmental expenditure results in the net value extracted: this amount corresponds to what the company withdraws from the environment without making any sort of compensation. The impact on the environment of the company's operations is thus expressed in financial terms. By offsetting these costs against the company results, a realistic picture is

formed of the company's result.

*Environmental impact of corporate activities*

The effects of a company's activities on the environment can be subdivided into two categories: direct and indirect.

Direct effects include the company's own pollution and the impact of its own energy consumption (heating, cars, etc.), while indirect effects relate to the environmental impact caused by third parties in the production of raw materials purchased by the company (upstream effects) and through the use of products manufactured by the company (downstream effects).

In compiling BSO/Origin's environmental accounts, account has been taken of the direct environmental effects only. The effects resulting from the production by suppliers of paper, computers and photocopiers have therefore not been included. There are several reasons for making an exception in the case of electricity generation - if this is not included in the environmental accounts, it becomes all too simple to reduce the company's own environmental costs at the expense of 'general' electricity generation.

*Note to the figures*

BSO/Origin's overall environmental impact has been calculated by adding up the environmental impact of all

individual cells.

A number of questionnaires were returned incomplete. In many cases, this was due to problems in estimating the various types of use. Cells which take up office space within a larger building do not always know their own energy consumption figures, for example, and were thus unable to submit them, as was evident from the answers to the detailed survey. The missing data have been extrapolated using the answers from the complete questionnaires, using an average figure per employee.

With respect to the direct environmental effects, the environmental accounts take the formation of the pollutants as the starting point; after reduction by the company's own equipment (such as catalytic converters for cars), but before transportation to third-party purification and treatment plant. The costs of direct environmental effects are based on the costs of treatment and processing of gaseous, liquid or solid waste flows by third parties plus the costs relating to the environmental impact of the residual substances (incineration residues, sludge, etc.).

The figures in the environmental accounts are based on basic data supplied by some 70 cells, which to this end completed a list in which questions were asked about the number of staff,

the nature of the office space, energy consumption, the purchase of paper, the number and type of company cars and the fuel they used, the number of miles travelled (including miles travelled in employees' cars for business purposes), the number and type of airplane trips and the waste production and separation. In addition, account has also been taken of the environmental levies and expenses relating to the cell in question.

It is one of BSO/Origin's particular features that many of its staff do not physically work at the company's own location but at the premises of various clients. The environmental costs generated by them there, such as waste production, energy consumption and water pollution, are borne by the customer and are consequently not included in BSO/Origin's environmental accounts.

No waste item has been included in the accounts for the thousands of personal computers owned by the company, as these are usually not disposed of in the form of waste but given to third parties, such as schools and the like, for further use.

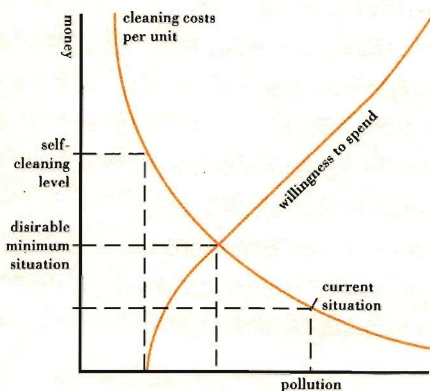
The same principle applies to leased equipment, such as photocopiers and cars, which at the end of their useful life cause damage to the environment. We have however assumed in our calcula-

tions that this damage is caused by the owner, although naturally this does not apply to the cost of their use.

*Estimate of costs of residual effects*

Various residual emissions have been accounted for in the environmental accounts, the separate components of which are expressed in Dutch guilders. These forms of pollution can be roughly divided into four categories: those caused by the company itself (including transportation), and pollution produced by power station emissions, water treatment plant and incineration ovens.

A pragmatic approach has been adopted in estimating the costs, based on the marginal cost of the emission reduction measures in 'optimal' environmental circumstances. This means that society takes environmental measures to the point where the marginal cost of these measures equal its marginal benefits (see graph). Sadly, there is still a large gap to be bridged between our current situation and this 'optimal' situation.



With regard to counteracting emissions, these environmental accounts are based on the following assumptions:

- According to the Dutch government's 'National Environmental Policy Plan Plus' (NEPP+), nitrogen oxide emissions must be reduced between 1985 and the year 2000 by 56 per cent and sulphur dioxide emissions by 70 per cent. In order to realize this, we are estimating the costs at twice the level indicated by the authors of NEPP+.
- Carbon dioxide emissions must be reduced over the same period by at least 60 per cent, according to the recommendations made by the IPCC (Inter-Governmental Panel on Climate Change).
- Treated waste water must meet the drinking water standard.
- Part of the waste is recycled and the remainder fully incinerated. With respect to incineration we have based our calculations on the costs of atmospheric emissions and disposal of incineration ashes.
- As the true extent of environmental damage caused by emissions is still not clear, we have based our calculations on the same values as last year, thus making a fair comparison of the figures possible.

The values used in calculating the specific costs of the damage are Dfl. 10.00 per kilogram NO<sub>x</sub> for stationary sources and air traffic and

Dfl. 20.00 for cars. The latter value is higher because of the contribution of car traffic to local pollution and higher concentrations occurring during peak hours.

The total costs of car traffic are estimated at Dfl. 40.00 per kilogram  $\text{NO}_x$ , including the pollution caused by carbon monoxide and hydrocarbons.

The value of Dfl. 14.00 per kilogram for  $\text{SO}_2$  emissions is arrived at by assuming that the environmental impact (the formation of acid rain) is proportional to the number of acid equivalents.

There are a number of ways of limiting  $\text{CO}_2$  emissions, varying from energy conservation and reforestation to no economic growth. As a result, the cost estimates of such activities can vary substantially. Based on a number of different investigations and the basic premise of the reduction of emissions to 60 per cent mentioned earlier, we can estimate the costs of the damage at Dfl. 100.00 per ton. The carbon dioxide emitted by waste incineration plant has been valued at nil, as it is derived from biomass and does not constitute a net emission.

Waste water production is expressed in inhabitant equivalents based on the company's water consumption. Average costs incurred in The Netherlands are used to calculate the costs of transportation and water treatment per inhabitant

equivalent. The damage to the environment caused by the residual waste is estimated at roughly twice the current water treatment costs.

BSO/Origin's waste consists largely of paper (fanfold forms, writing paper, periodicals and newspapers). In 1992, 40 per cent of this waste was disposed of separately. The calculation allows for 90 per cent recycling, the costs of which are not charged to the company. The remainder of the paper is added to the total household waste, which is processed in large incineration plants.

Our estimation of the damage to the environment is based on incineration in waste incineration plant. The costs of the damage to the environment then consist of the costs of removal and incineration plus those of the residual air pollution and ash disposal. Removal costs average Dfl. 80.00 per ton in The Netherlands, incineration costs Dfl. 100.00 per ton. The damage to the environment as a result of heavy ash, fly ash, flue gas purification residues and water treatment sludge has been fixed at Dfl. 100.00, Dfl. 200.00 and Dfl. 500.00 per ton of dry matter, respectively.

## COSTS OF ENVIRONMENTAL EFFECTS

in thousands of Dutch guilders

	Emission	Unit cost	<u>1992</u>	<u>1991</u>
			Dfl.	Dfl.
<i>Atmospheric emissions</i>				
<i>Natural gas consumption</i>				
<i>(for heating)</i>				
<i>NO<sub>x</sub></i>	565 kg	10 Dfl./kg	5	5
<i>CO<sub>2</sub></i>	598 t.	100 Dfl./t.	60	50
Total			65	55
<i>Electricity consumption</i>				
<i>SO<sub>2</sub></i>	7,778 kg	14 Dfl./kg	109	106
<i>NO<sub>x</sub></i>	4,670 kg	10 Dfl./kg	47	58
<i>Dust</i>	640 kg	10 Dfl./kg	6	6
<i>CO<sub>2</sub></i>	2,087 t.	100 Dfl./t.	209	234
Total			371	404
<i>Road traffic</i>				
<i>NO<sub>x</sub></i>	47,876 kg	40 Dfl./kg	1915	1899
<i>HCl</i>	25,752 kg			
<i>CO</i>	134,869 kg			
<i>CO<sub>2</sub></i>	9,414 t.	100 Dfl./t.	941	1044
Total			2856	2943
<i>Air traffic</i>				
<i>NO<sub>x</sub></i>	2,144 kg	10 Dfl./kg	21	14
<i>CO<sub>2</sub></i>	585 t.	100 Dfl./t.	59	38
Total			80	52
<i>Waste incineration</i>				
<i>SO<sub>2</sub></i>	319 kg	14 Dfl./kg	4	5
<i>NO<sub>x</sub></i>	393 kg	10 Dfl./kg	4	4
<i>Dust</i>	270 kg	10 Dfl./kg	3	3
<i>HCl</i>	737 kg	13 Dfl./kg	10	10
<i>CO<sub>2</sub></i>	295 t.	0 Dfl./t.	0	0
Total			21	22
Subtotal			3393	3476

	Emission	Unit cost	1992 Dfl.	1991 Dfl.
Subtotal			3 393	3 476
<i>Waste water</i>				
<i>Water treatment</i>	547 inh. eq.	48 Dfl./i.e.	25	18
<i>Transportation</i>	547 inh. eq.	12 Dfl./i.e.	7	5
<i>Residual water pollution</i>			53	36
Total			85	59
<i>Waste</i>				
<i>Waste produced by the company</i>				
<i>Collection</i>	384 t.	80 Dfl./t.	31	33
<i>Incineration</i>	246 t.	100 Dfl./t.	25	25
<i>Residual post-incineration waste</i>				
<i>Heavy ash</i>	25 t.	100 Dfl./t.	2	3
<i>Fly ash, flue gas residues</i>			4	2
Total			62	63
<i>Waste produced by power stations</i>				
<i>Fly ash</i>	55 t.	200 Dfl./t.	11	12
<i>Waste produced by water treatment plant</i>				
<i>Sludge</i>	8 t.	500 Dfl./t.	4	3
	dry matter			
Total			3 555	3 613

	<u>1992</u>	<u>1991</u>
	Dfl.	Dfl.
<b>Environmental expenditure</b>		
in thousands of Dutch guilders		
<i>Fuel levy, The Netherlands</i>		
<i>Natural gas for heating purposes</i>	1	1
<i>LPG for cars</i>	24	20
<i>Fuel for power stations</i>	6	5
Total	31	26
 <i>Purification levies, garbage collection rates, sewerage tax and other environmental taxes</i>		
	311	228
Total	342	254

**Net value extracted**  
in thousands of Dutch guilders

<i>Costs of environmental effects</i>	3 555	3 613
<i>Environmental expenditure</i>	(342)	(254)
Total net value extracted	3 213	3 359

**Net value added**  
in thousands of Dutch guilders

<i>Value added</i>	411 036	377 298
<i>Value extracted</i>	(3213)	(3359)
Net value added	407 823	373 939

<i>Value added</i>	personnel costs + depreciation, provisions + financial <b>expense</b> + taxation + net profit (or loss)
<i>Net value added</i>	value added less value lost
<i>Value extracted</i>	costs of the environmental effects caused by the company's operations, less the company's expenditure to mitigate these effects
<i>Costs of environmental effects</i>	environmental costs relating to the processing or treatment of emissions + costs of residual effects
<i>Residual effects</i>	environmental effects remaining after completion of all treatment and processing activities
<i>Costs of residual effects</i>	residual <b>effects</b> expressed in monetary terms
<i>Environmental expenditure</i>	payments to third parties + environmental taxes - environmental grants
<i>Payments to third parties</i>	payments for subcontracted environmental activities relating to the company's emissions (water removal and treatment, waste collection and disposal)
<i>Marginal costs</i>	unit costs of treatment and/or processing of emissions at a given emission level