with a very low formation of hydrocarbons. The catalyst consumption of the suspension process, which is in the range of 0.4-0.7%, is considerably higher than in the fixed bed process (0.2-0.3%). Energy consumption is estimated to be in the same order of magnitude, the suspension process requiring higher temperatures, and the fixed bed process having a larger power installed for bigger recirculation pumps and compressors.

The quality of the crude fatty alcohols resulting from the fixed bed process is better, with a lower hydrocarbon content and lower saponification values. The fatty alcohol of the suspension process can be brought up to the same quality level; however, this requires an additional purification step.

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West European Household Detergent Trends

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ABSTRACT

It is estimated that there will continue to be a relatively strong growth in demand for alcohol derivatives, ca. 3 times as high as that for the product sector as a whole. Detergent alkylate growth will be somewhat lower, but it will remain the staple diet of the industry and by far the single largest volume detergent intermediate.

Household detergents – both the heavy-duty products used for the domestic laundry and the light-duty washing-up liquids – constitute the single largest segment of various detergent market sectors. In terms of active matter, it represents some 60% of a total annual West European demand currently running at ca. 1,200,000 metric tons.

The household market is tending towards maturity and its growth has now declined to levels below expected average West European GNP growth rates. Although the future detergent product growth rates may be modest in comparison with those of the 1950s and 1960s, the growth in demand for particular types of active matter is expected to be considerably higher. Within an overall modest growth rate for the product as sold to the consumer and assuming no change in average active matter content, a high relative growth rate for particular types of active matter can be achieved if products are reformulated.

The driving forces for the expected reformulation – particularly of the heavy-duty products – are provided by both environmental requirements and the need to maintain the products as new and innovative in the consumer's mind. Thus, even in depressed economic conditions, one would expect change to occur, and, particularly if this is coupled with improved cost performance of the product, change becomes inevitable.

It is necessary for a company like my own, a major supplier of detergent intermediates (the chemical derivatives of which find their way into the products sold to the consumer) to understand these formulatory trends if we are going to continue to be successful in providing products in the right volumes at the right times in response to market requirements.

LIGHT-DUTY LIQUIDS

Former growth rates of 7-8% per annum have declined and are expected to be of the order of 1-2% per annum until the end of the decade. The historical usage and expected future demand is shown in Table I.

The higher growth rate in the latter part of the decade is caused by some countries changing from powders to liquids.

Formulation of light-duty liquids has changed over the last 10 years principally as a result of the introduction of paraffin sulfonates. Further changes are expected as alpha olefin sulfonates (AOS) become increasingly available and afford the formulator the opportunity to improve the mildness of the product while maintaining detergency. The expected changes in demand for active matter are shown in Table I.

HEAVY-DUTY SECTOR

The heavy-duty product sector is by far the largest of the household product market, as shown in Table II. It is in this sector that environmental constraints have, and will continue for some time to have, a strong influence on the formulation of these products. Significant parameters in this context are:

–trend towards lower phosphate levels from 30-40% to ca. 20% backed by legislation in some countries;
–energy conservation lowering average wash temperatures from 60 C to 40 C;
–further slight increase of the synthetic component in the textile mix; and
– product cost/performance.

Although 2-3 years ago we expected the industry response to these requirements to be both higher active matter levels and increased usage of alcohol long-chain ethoxylates (nonionics), matters developed differently. Currently there are four separate trends or combinations of these: high nonionic based formulations, high bleach levels, use of bleach activators, and zeolite/phosphate combinations.

The basic expectation that usage of nonionics would increase was correct. It is relevant to point out that the reason for the use of long-chain ethoxylates was their lower sensitivity to hard water – compared to alkylbenzene sulfonate – and their efficiency in cleaning, particularly of synthetics. The use of these products also permitted the cost/performance of the product to the enhanced: washing efficiency was improved and the expensive phosphate component reduced. Additionally, heavy-duty liquids were introduced into Germany and France – two of the major detergent markets in West Europe – the majority of these liquids contain no phosphate; to compensate for this, they contain nearly 3 times as much active matter as powders per unit weight of product.

Although we expect that, for the reasons already cited, long-chain ethoxylates will continue to increase it is also

TABLE I

Light-Duty Liquid Active Materials in Thousand Metric Tons (average annual percentage increase shown in parentheses)

Active ingredient	1975	75-80	1980	80-85	1985	85-90	1990
Total light-duty liquids used	650	(7.6)	870	(1.0)	920	(1.9)	1,010
Total active matter	136	(6.0)	185	(2.4)	208	(2.0)	230
LAS	88	(0.9)	92	(1.1)	97	(2.0)	107
EOS	40	(6.2)	54	(–)	54	(–)	55
PAS	18	(31.3)	39	(0.5)	40	(–)	40
AOS	–	(–)	–	(–)	17	(10.5)	28
Average active matter concentration (%)	21.2		21.3		22.7		22.8

AOS: alpha olefin sulfonate; EOS: alcohol ethoxysulfate; LAS: linear alkylbenzene sulfonate; NI: nonionic (alcohol long-chain ethoxylate); PAS: primary alcohol sulfate.

TABLE II

Active Matter Projections in Total Heavy-Duty Products in Thousand Metric Tons (average annual percentage increase shown in parentheses)

Active ingredient	1975	75-80	1980	80-85	1985	85-90	1990
Total heavy-duty products used	2,320	(2.0)	2,565	(1.5)	2,749	(1.0)	2,900
Total active matter	385	(-0.8)	369	(0.5)	378	(0.8)	401
LAS	242	(-2.5)	213	(0.5)	218	(0.9)	228
NI	56	(6.3)	76	(2.5)	86	(1.5)	93
Soap	87	(-4.5)	69	(-9.0)	43	(-2.4)	38
PAS	–	(–)	11	(23.0)	31	(6.3)	42
Average active matter concentration (%)	16.6		14.4		13.8		13.8

TABLE III

Active Matter Projections in Heavy-Duty Powders in Thousand Metric Tons (average annual percentage increase shown in parentheses)

Active ingredient	1975	75-80	1980	80-85	1985	85-90	1990
Total heavy-duty products used	2,320	(2.0)	2,565	(0.6)	2,670	(–)	2,665
Total active matter	387	(-0.9)	369	(–)	369	(–)	366
LAS	243	(-2.6)	213	(–)	213	(–)	215
NI	56	(6.3)	76	(1.5)	82	(–)	82
Soap	86	(-4.3)	69	(-9.0)	43	(-8.9)	27
PAS	–	(–)	11	(23.0)	31	(6.3)	42
Average active matter concentration (%)	16.6		14.4		13.8		13.7

likely that primary alcohol sulfates will increase in importance. The reason for this is that these molecules are even less sensitive to hard water than nonionics but, perhaps more importantly, are such efficient detergents that their presence will enable washing cycle times to be reduced and energy to be conserved.

The long-term expectations for active matter demand are also shown in Table II. It is relevant to mention that we expect linear alkylbenzene sulfonate (LAS) to remain the dominant active. As Table II shows, the demand for LAS is expected to continue to grow at a little below that of the growth rate for heavy-duty products as a whole. It can also be seen from the figures that we expect there to be a trend for further slight reduction of the active matter concentration.

The estimated demand for heavy-duty products and corresponding requirements for active matter are influenced by the expected rapid growth of heavy-duty liquids.

HEAVY-DUTY POWDERS

Table III shows the situation considering powders alone. It is evident, as was to be expected, that the heavy-duty liquids grow at the expense of powders.

Requirements for active matter for powders are also shown in Table III. From the table, it can be seen that the alkylate requirement is static, as is that for nonionics in the last 5 years of the decade. The primary alcohol sulfate, however, shows continued growth for reasons already mentioned.

HEAVY-DUTY LIQUIDS

Turning, finally, to the heavy-duty liquids, we expect the demand pattern for the products to emerge as shown in Table IV. The average active matter concentration is currently 44%, with roughly equal parts of linear alkylbenzene sulfonate, alcohol long-chain ethoxylates and soap. It is as yet too early in the development of these products to discern a trend.

TABLE IV

Active Ingredients Consumption in Heavy-Duty Liquids

Year	Thousand metric tons	Average annual growth rate (%)
1982	26	45
1985	80	24
1990	233	