

History of Japanese Syndets

THE CONSUMPTION OF SYNDETS in 1953 was only 11,500 metric tons. It recorded 310,795 tons in 1964 and it is estimated in the neighborhood of 360,000 tons in 1965. Thus, syndets achieved a remarkable growth in 10 years. This is summarized in Figure 1. The marked increase of syndets is evident in contrast with the decrease of bar soaps and powdered soap. The average annual growth rate of soap and detergents has been 6.9%. Syndets have replaced soap quite rapidly (see Table I).

Alkylbenzene based detergents increased quite rapidly, while higher alcohol based detergents showed a decrease after 1960. This tendency was caused mainly by the price difference between alkylbenzenes and higher alcohols.

Alkylbenzene has been produced by Nippon Petroleum Detergent, Mitsubishi Petrochemical and Sumitomo Chemical for some years and the price now is Y85/kg (10.7¢/lb). On the other hand, synthetic higher alcohols are produced by high pressure hydrogenation of coconut oil and the price has been Y160-180/kg (20.2-22.8¢/lb). Thus, fluctuation of the coconut oil market had determined the price of the higher alcohols and the industry had to deal with unstable raw material costs.

The syndet industry mainly based on alkylbenzene, is still expanding in Japan. The expansion is due to greater use and availability of washing machines (see Table II).

Water is soft all over Japan (Fig. 2) and weather is mild except in the Hokkaido area. Housewives employ cold water rather than hot water in washing. The housewives who find syndets work better than soap in cold washing have switched to syndets. Syndet producers diversified and supply a variety of products: powdered (sprayed) detergents, dish-washing liquids and shampoos.

Detergents in Japan, Today and Tomorrow

The development of syndets in Japan is not unlike that in the United States. Figure 3 indicates the similarity of the growth trends of soap and syndets in both countries within a 10 year time lag. Syndets reached a 40-50% share in 1951-1953 in the US market. After that, the growth lost its aggressiveness, leveling off when the increase reached 80%. In Japan, the syndet's market share reached 40-50% in 1961-1962 (Table I). The trend of the growth before and after this period is very similar to its counterpart in the US. Thus, the trend in the US is applicable when we forecast syndet markets in Japan.

By the statistical approach described below, the syndet and the washing soap (bar and powder) is forecast and tabulated in Table III.

$$y_t = 0.3893 x_{1t} + 0.5634 x_{2t} + 0.2316$$

$$(R = 0.9875)$$

Where:

y_t = Estimated demand for total syndet and powder soap

x_{1t} = Index for increase of number of washing machines in use

x_{2t} = Index for personal expenditure

TABLE II

Predicted Increase in Washing Machines^a

Fiscal year	Number of washing machines (1), thousand	Number of families (2), thousand	(1)/(2) %
1958	3,284	19,480	16.5
1959	4,252	19,900	20.9
1960	5,609	20,350	27.0
1961	7,504	20,950	35.3
1962	7,670	21,660	44.5
1963	11,818	22,210	53.2
1964	13,875	22,770	58.2
1965	15,373	23,349	65.5
1966	16,467	23,842	68.7
1967	17,286	24,350	70.9
1968	18,105	24,873	72.4
1969	18,727	25,410	73.3
1970	19,292	26,106	73.9

^a Source: Association of Electric Machine Industries.

The Characteristics of Japanese Syndets

Heavy duty powder detergents represent 70-75% of the syndet market, which is comprised of the following types: heavy duty, 75-80%; light duty for fabrics, 3-5%; light duty liquids, 15-17%; floor and furniture detergent, 3-5%; shampoos, 1-2%.

The breakdown according to physical form is as follows: powders, 80-83%; liquids, 16-18%; pastes, 2%.

Most of the heavy duty detergents are of the "controlled suds" variety. To bring about this effect, 1-3% soap is added to the formula. This provides ease of rinsing. Another characteristic of Japanese syndet formulations is a relatively low sodium tripolyphosphate and a relatively high surfactant content. Typical formulas are shown below:

	Lower priced	Higher priced
Alkylbenzene sulfonate	15-20%	20-30%
Sodium tripolyphosphate	15-20%	20-35%
Sodium silicate	2-7%	2-5%
Soap	1-2%	1-2%

These formulas have been developed in response to the property of Japanese water, washing customs and economic environment. Recently more stress was put on perfumes which characterize products from various manufacturers.

Two brands of low suds heavy duty detergents, based on nonionic surfactants are on the market, but these are not popular. The washing machines used in Japan are pulsator type and they do not favor these formulations.

Light duty detergents are recommended on washing fabrics and for kitchen use. Most of them are liquid, and

TABLE I
Replacement of Bar and Powder Washing Soap by Syndet

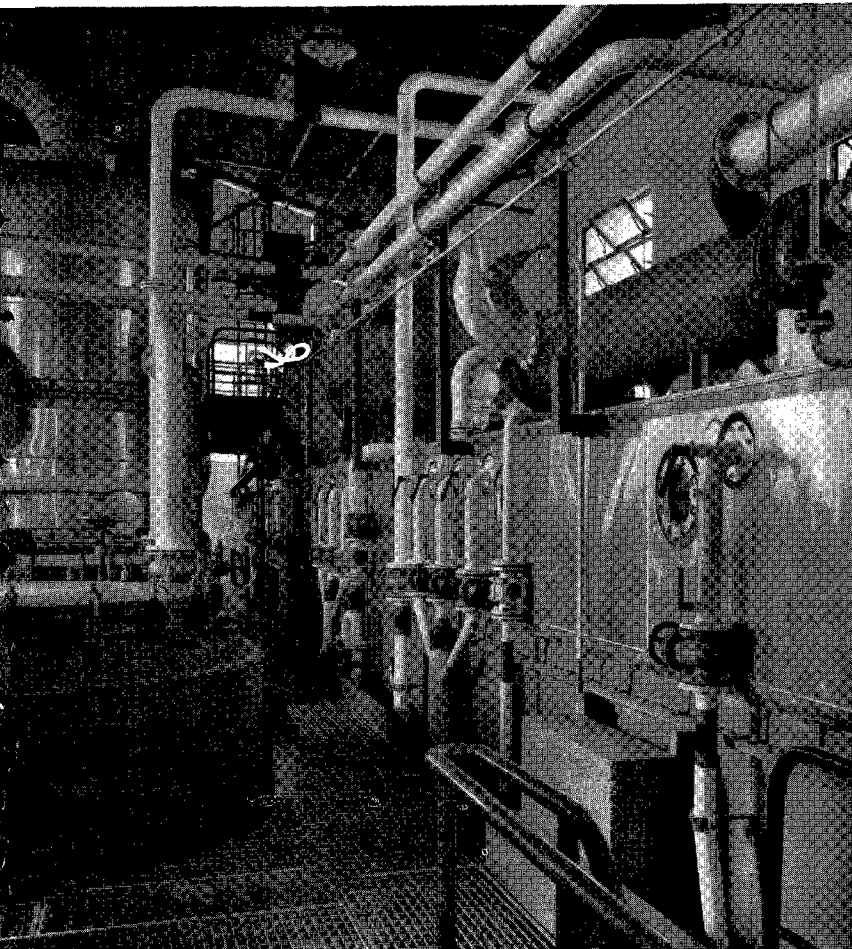
Fiscal year	Bar & powder washing soap			Syndet			Soap & syndet total	
	Amount, metric ton	Annual change, %	Share, %	Amount, metric ton	Annual change, %	Share, %	Amount, metric ton	Annual change, %
1955	213,360	115	93	16,039	124	7	229,399	116
1956	235,925	111	91	23,649	147	9	259,574	113
1957	245,120	104	91	23,871	101	9	268,991	104
1958	283,502	97	89	34,159	143	11	317,661	118
1959	295,799	104	85	53,017	155	15	348,816	110
1960	250,282	85	73	93,599	177	27	343,881	99
1961	210,255	84	57	160,093	171	43	370,348	108
1962	169,101	78	45	203,770	127	55	366,871	99
1963	129,548	79	33	260,684	128	67	390,232	106
1964	101,267	78	25	310,795	119	75	412,062	106

Our program includes:

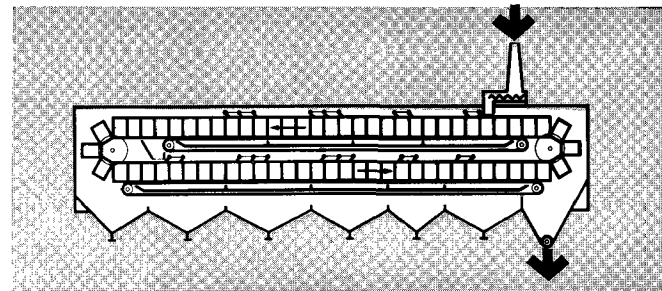
Supply of plant and process for
extraction of oilseeds and animal bodies
oil desolventizing
vapour scrubbing
meal toasting and desolventizing
meal drying and cooling
recovery and refining of lecithin
refining of edible oils
hydrogenation of oils and fatty acids
distillation and fractionation of fatty acids in high vacuum
high pressure fat splitting without splitting agents
evaporation of sweet waters and spent soap lyes
distillation of crude glycerin
production of fatty alcohols

Production and Processing of Fats and Oils

Continuous Solvent Extraction of Oilseeds



Main attendance platform of a LURGI Solvent Extraction Plant;
capacity 400 metric tons of oilseeds/24 hours.



The core of a LURGI solvent extraction plant is the horizontal frame belt extractor featuring an infinite belt composed of frame cells the bottoms of which are constituted by infinite screen belts circulating at synchronous speed.

Advantages:

easy handling
excellent safety in operation
uniform deoiling
clear miscella of high concentration
tender conveyance of extraction material
minimum space requirements.

Economic Characteristics:

throughput 10-1000 metric tons/day and unit
220-280 kg. of steam to the ton of extraction
material, depending on size of unit 2-5 kg.
of extraction benzine per ton of extraction material,
depending on size of unit
residual oil content after good material
preparation: up to 0.2%.

91 plants have to date been built for
extraction of oilseeds of all kinds totalling
a nominal capacity of 4.3 million tons annually.



Associated Lurgi companies:
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Lurgi Gesellschaft für Chemie und Hüttenwesen mbH
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**LURGI GESELLSCHAFT
FÜR WÄRMETECHNIK MBH
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TABLE III
Estimated Sales and Replacement of Total Detergent

Fiscal year	Washing bar soap		Powder soap		Soap, total			Synthetic detergent			Total	
	Sales, ton	Annual change	Sales, ton	Annual change	Sales, ton	Annual change	Share, %	Sales, ton	Annual change	Share, %	Sales, ton	Annual change
1965	58,000	81	27,500	81	85,500	84	19	358,500	115	81	444,000	107
1966	52,000	90	25,000	91	77,500	91	17	392,000	109	83	469,500	106
1967	50,000	95	22,500	90	72,500	94	15	422,500	108	85	495,000	105
1968	47,500	95	22,500	100	70,000	97	14	448,500	106	86	518,500	105
1969	47,500	100	22,500	100	70,000	100	13	472,500	105	87	542,500	105
1970	47,500	100	22,500	100	70,000	100	12	496,500	105	88	566,500	104

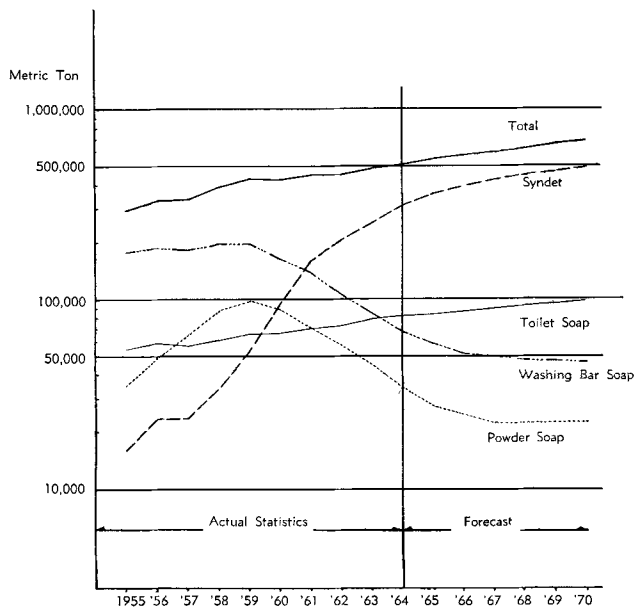


FIG. 1. Sales of soap and detergent.

are based on alkylbenzene sulfonate. Some typical formulas are shown:

	A	B	C
Alkylbenzene sulfonate	20-35%	15-25%	10-21%
Nonionic surfactant	-2%	-3%	1.5-10%
Ethanol	10-25%	-7%	10-20%
Urea	-	10-20%	-
Water, perfume, etc.	50-70%	65-75%	60-75%

Recently a soft detergent formulated with a higher alcohol ethoxylate was introduced. This represents the beginning of a new era in the detergent business in Japan.

Future of Syndets in Japan

The future market of Japanese syndets is estimated in Table III. Steady growth is expected to continue, even though the rate of growth as realized in the past will not be maintained.

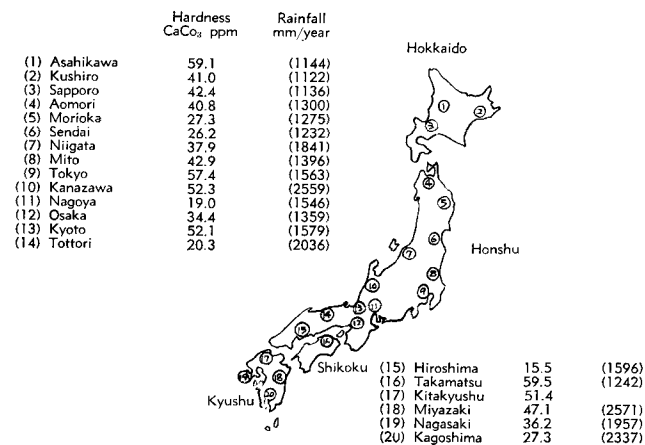


FIG. 2. Hardness of water and annual rainfall in Japan.

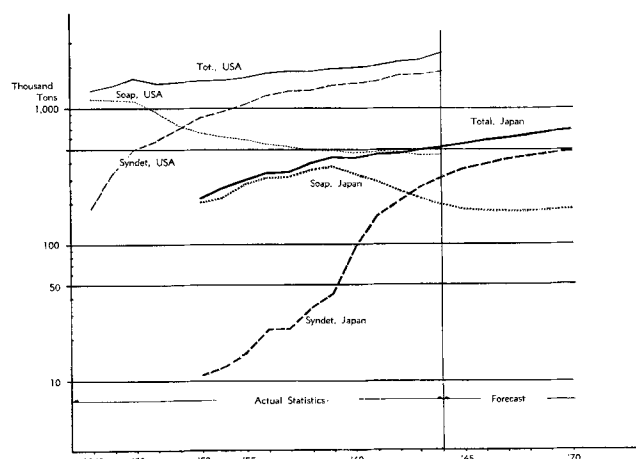


FIG. 3. Soap and detergents in the USA and Japan.

A matter which attracts increasing attention is the problem of soft detergents. At present, there exists no serious foaming problem in Japanese surface waters. Rivers in Japan are short and rapid. Water is said to travel in two days from the origin of the stream to the ocean even in the case of the longest river. In addition, Japan has abundant rain and the water is not repeatedly used through processing.

However, detergent pollution will undoubtedly become a problem in the future. The usage of treated sewage water as industrial water was started in industrial areas around big cities. Therefore, the quality of the treated water becomes important. This increase of requirements for water and sewage grows with the increase of population. However, both water supply and sewage treatment systems are so poorly equipped and developed that only 20-30% of sewage is treated even in big cities. It is suspected that untreated sewage is allowed to go directly into ground and surface water. This makes an early switch to soft detergents important.

It follows that higher alcohol or linear alkylbenzene based detergents will become more important. Research efforts to formulate heavy duty detergents based on these derivatives are being studied. Use of higher alcohols and linear alkylbenzenes will surely increase in the future.

CALL FOR PAPERS FOR PHILADELPHIA

In addition to regular papers on the subject of Fats and Oils, Nutrition and Biochemistry and Detergents, plans are being developed for a number of Symposia. Topics already well-developed are:

- Flavors and Odors in Foods
- Germicidal Activity in Surface Active Materials
- Ore Flotation

Papers are especially solicited in the field of Chemical Derivatives of Fats. Titles, authors and definitive abstracts should be sent by July 5, 1966, to

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