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Japan Report

(FOUO 57/81)

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SCIENCE AND TECHNOLOGY

LIST OF TOP 100 BUSINESS FIRMS IN MACHINERY SALES FOR FY 1980 COMPILED

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 29 Jul 81 p 6

[Text] Machine Tools Group Makes Advance; Makes Inroads Into Top 100 Positions; Sales Volume Increases 25.5 Percent

Business showing of Japan's powerful machinery firms in 1980 has shown remarkable growth thanks to the "machinery boom." Nihon Keizai Shimbunsha has carried out "the second top 100 machinery firms ranking" of Japan's powerful machinery firms (including the consolidated firms). According to the results of this investigation, the total 1980 sales volume of the top 100 firms among those who responded reached 13,683,700,000,000 yen, exceeding the actual results of the top 100 firms of the previous year by 25.5 percent. The machinery firms are said to have sung the praise of this unprecedented machinery market activity. Moreover, the total sales volume of the top 100 firms as a percentage of the total sales of Japan's machinery and tool wholesalers (based on the commercial statistics and the commercial movement statistics) jumped from 22.2 percent in 1979 to 26.3 percent in 1980; clearly indicating that concentration of top ranking firms was in progress.

In order to grasp the actual state of the current machinery business circle, 386 powerful machinery firms (refer to the "method of investigation" for the method of selecting the subject firms for study) were chosen and an investigation was carried out by means of a questionnaire including, among others, the questions concerning 1979 and 1980 sales volumes and the prospect of 1981 sales.

The machinery chosen as the subject for study included general industrial machinery, tools, parts, precision light machines, ships, and railroad rolling stocks. Automobiles, electronic computers, household appliances, and general electric machines were not included in the study this time.

According to the results of investigation, the total sales volume of top 100 firms in 1980 amounted to 13,683,700,000,000 yen which was 25.5 percent over the 1979 sales volume of 10,902,600,000,000 yen. In spite of dullness in the construction machinery business due to holdback on public investment and a $10 billion setback in plant export due to worsening circumstances in 1980, domestic demand and export of machine tools, precision machines, tools and parts experienced an unprecedentedly favorable activity, so that a significant growth was shown as a whole.

Based on the "first top 100 machinery firms ranking" carried out in September last year, the 1980 sales volume was projected to grow 16.7 percent over 1979. The actual 1980 sales results far exceeded this prediction, indicating that the activity of Japan's machinery firms was better than expected.

Moreover, based on those firms which responded to the question about 1981 sales forecast, the 1981 planned sales volume will rise 12.4 percent over 1980. Reacting to the very high growth rate in 1980, the anticipated growth rate is somewhat lower, but it still represents two-digit high growth rate. Except for a concern felt by a portion of the firms about the wane of the machinery boom toward the latter half of 1981, the sales forecast is strong overall.

As expected, the top 10 positions of the 1980 top 100 firms ranking included 9 large consolidated firms. Moreover, the 9th through the 20th positions were led by K. Hattori & Co. Near the top were five sales firms affiliated with Yammar Agricultural Machinery, Shinko Shoji, Citizen Shoji, and Cannon.

Moreover, compared with the 1979 top 100 firms ranking, the fact that firms dealing in favorable lines of machine tools rose in ranking was quite conspicuous. Yamazen rose from 14th to 11th position, while Gomiya rose from 31st to 28th position, and Kanematsu Gosho Machine Tool rose from 33rd to 29th position. Besides these, Mitsui Machine Tools, Katsuyama Machinery, and Yachiyoda Industry also made an outstanding advance.

On the other hand, those firms dealing mainly in dull construction machinery, including Nakamichi Machinery Industry, Narazaki Industry, Kyushu Construction Machinery Sales, and Itoman each dropped approximately 10 positions in ranking. Black and white were clearly determined by the type of machinery dealt with. Those firms which were ranked below 101st in 1979 and were included in the top 100 in 1980 included Reybold and Muranaka Medical Instrument. Conversely, those firms which were dropped included Nippon Scientific Machinery and Tominaga Industry.

Method of Investigation

This investigation was carried out on 386 powerful machinery firms chosen from among Japan's 69,497 machinery and tool wholesalers based on the following criteria: 1) Listed (stock) enterprise, 2) Member enterprise of Japan Machinery Import Association, 3) "Corporation income 50,000 ranking--Machinery and Tool wholesaler" compiled by Nikkei Business. The questionnaire included, among others, questions concerning sales volume of all departments dealing in machinery and the kinds of machinery handled as of 15 July.

In this investigation, the range of "machinery" was limited to the general machinery (including plant, wind and hydropower machinery, chemical machinery, boiler and internal combustion engines, transportation and load-handling machinery, machine tools, metal work machinery, wood work machinery, fiber machinery, hydraulic machinery, food machinery, printing machinery, construction machinery, packaging machinery, agricultural machinery, air-conditioning machinery, and other general industrial machinery), tools and parts (including bearings, valves, gears, screws, springs, tools, and other), precision light machinery (watches, optical instruments, cameras, sawing machine, medical instruments, business office machines, and measurement instrument), ships, and railroad rolling stocks.

1980 Top 100 Machinery Firms of Japan

(Unit: million yen; - represents "minus"; number inside parentheses represents 1979 ranking)

Rank	Firm name (head office location)	1980 actual sales volume	Growth rate	Export rate	1981 sales plan	Settlement term	Main items handled
1 (1)	Mitsubishi Corporation (Tokyo)	2,200,000	26.4	53.0	--	3	Plant, machinery in general
2 (2)	Mitsui & Co. Ltd. (Tokyo)	1,533,000	19.0	48.9	1,620,000	3	" "
3 (3)	Sumitomo Shoji Kaisha, Ltd. (Osaka)	1,503,400	35.4	52.0	1,653,700	3	" "
4 (4)	Marubeni (Osaka)	1,350,000	28.6	60.7	--	3	" "
5 (6)	C. Itoh & Co., Ltd. (Osaka)	1,134,200	51.6	79.9	1,079,600	3	" "
6 (5)	Nissho-Iwai Company Ltd. (Osaka)	1,075,452	25.9	48.2	1,450,000	3	" "
7 (7)	Nichimen Company, Ltd. (Osaka)	623,424	37.7	68.7	750,000	3	" "
8 (8)	Toyo Menka Kaisha, Ltd. (Osaka)	481,905	32.2	45.9	580,000	3	" "
9 (9)	K. Hattori & Co., Ltd. (Tokyo)	341,468	20.7	48.1	357,000	3	Clock
10 (10)	Kanematsu-Gosho, Ltd. (Tokyo)	266,600	21.6	45.2	323,000	3	Plant, machine tools
11 (14)	Yamazen Co., Ltd. (Osaka)	149,960	24.5	45.8	165,000	9	Machine tools, tools
12 (12)	Yuasa Ltd. (Tokyo)	143,004	6.0	8.7	156,780	3	Construction machinery, machine tool
13 (13)	Yammar Agricultural Machinery (Osaka)	127,304	3.8	3.2	128,000	12	Agricultural machinery
14 (15)	Shinko Shoji Kaisha, Ltd. (Osaka)	124,222	21.3	6.0	--	3	Construction machinery
15 (19)	Toyota Commerce (Nagoya)	123,397	63.7	25.2	125,093	3	Fiber machinery
16 (16)	Citizen Watch Co., Ltd. (Tokyo)	117,638	16.1	51.4	130,000	3	Watch

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Rank	Firm name (head office location)	1980 actual sales volume	Growth rate	Export rate	1981 sales plan	Settle-ment term	Main items handled
17 (11)	Tokyo Sangyo (Tokyo)	113,100	-27.8	7.2	156,000	3	Prime mover, industrial machinery
18 (17)	Cannon Sales (Tokyo)	111,002	25.9	0.0	--	12	Business machines, camera
19 (18)	Moriya Shyokai (Tokyo)	100,088	16.0	5.9	102,200	3	Windpower machinery, construction machinery
20 (25)	Seika Sangyo Co., Ltd. (Kitakyushu)	88,482	45.8	4.2	100,000	3	Power generating machinery
21 (21)	Kyokuto Trading (Tokyo)	87,387	31.7	10.7	93,500	3	Boiler, construction machinery
22 (20)	Okura Industrial Co., Ltd. (Tokyo)	77,619	7.4	36.4	125,000	3	Railroad machinery, machine tools
23 (22)	Okatani Steel & Machinery (Nagoya)	67,527	11.1	2.3	74,200	2	Metal work machinery, machine tools
24 (24)	Daiichi Jitsugyo (Tokyo)	57,871	2.3	18.9	62,000	3	Chemical & petroleum related machinery
25 (28)	Sumitomo Electro-mechanic Sales Co. (Tokyo)	54,996	20.1	0.0	62,471	3	Chemical machinery
26 (26)	Marubeni Sales (Tokyo)	54,686	2.7	0.3	60,500	3	Construction machinery
27 (25)	Asahi Optical Industry (Tokyo)	54,102	-1.5	63.4	60,000	3	Camera
28 (31)	Gomiya (Osaka)	45,777	17.0	14.1	52,600	9	Machine tools, tools
29 (33)	Kanematsu-Gosho Ltd. (Tokyo)	45,470	27.1	0.0	46,000	3	Machine tools
30 (27)	Hitachi Heating & Cooling (Tokyo)	45,311	-12.1	0.0	80,580	3	Air-conditioning equipment
31 (29)	Shinryo Heavy Machinery (Tokyo)	45,072	-1.1	0.0	47,800	3	Construction machinery
32 (35)	Tokyo Electron (Tokyo)	44,527	42.6	0.0	54,000	9	Semiconductor manufacturing machinery
33 (32)	Kanagawa Electric (Tokyo)	43,524	16.8	--	--	3	Heating/cooling machinery
34 (53)	Nissho-Iwai Aerospace (Tokyo)	43,496	107.3	9.1	35,377	3	Aviation machinery

Rank	Firm name (head office location)	1980 actual sales volume	Growth rate	Export rate	1981 sales plan	Settlement term	Main items handled
35 (30)	Sanyo Electric Food Equipment (Tokyo)	36,600	-9.9	0.0	38,600	11	Refrigerator, freezer showcase
36 (37)	Chiyoda Group (Tokyo)	34,385	11.9	0.0	40,000	3	Industrial machinery, parts
37 (47)	J. Osawa & Co., Ltd. (Tokyo)	33,056	33.9	52.5	41,500	12	Camera, business machines
38 (40)	C. Itoh & Co., Ltd. (Tokyo)	32,715	17.6	0.0	33,000	3	Industrial machinery
39 (42)	Tsubakimoto Industry (Osaka)	32,221	20.2	1.5	38,050	3	Transportation, load-handling, parts
40 (41)	Eiko Watch (Osaka)	32,091	16.7	5.5	35,000	8	Watch
41 (45)	C. Itoh & Co., Ltd. (Osaka)	31,817	23.6	41.2	31,100	3	Fiber machinery, knitting machinery
42 (38)	Sentetsu Shoji (Tokyo)	31,490	7.3	40.3	64,000	9	Iron making, industrial machinery
43 (36)	Banzai (Tokyo)	31,146	0.7	14.5	31,833	3	Automobile maintenance machinery
44 (39)	Teck Electronics (Tokyo)	30,770	8.3	--	36,345	3	Business machinery
45 (34)	Nakamichi Machinery (Tokyo)	30,139	-9.8	0.0	35,000	3	Construction machinery
46 (44)	Kinsho-Mataichi (Tokyo)	29,677	15.5	90.8	33,400	3	Internal combustion engine, industrial machinery
47 (50)	C. Itoh & Co., Ltd. (Tokyo)	28,618	21.1	0.0	33,240	3	Chemical, paper processing machinery
48 (49)	Mitsui & Co. Ltd. (Tokyo)	27,605	16.5	17.3	31,000	3	Chemical, wind and hydropower machinery
49 (48)	C. Itoh & Co., Ltd. (Tokyo)	27,183	13.7	12.7	33,207	3	Aviation related machinery
50 (73)	Chori (Osaka)	25,994	111.5	72.0	14,486	3	Plant, fiber machinery
51 (54)	Brother International (Tokyo)	24,039	16.3	100.0	25,500	3	Typewriter, sewing machine
52 (52)	MSK Tokyu Machinery (Tokyo)	23,873	5.6	0.0	24,143	1	Agricultural machinery, tractor

Rank	Firm name (head office location)	1980 actual sales volume	Growth rate	Export rate	1981 sales plan	Settlement term	Main items handled
53 (51)	Sanyo Electric (Tokyo)	23,641	1.6	0.0	28,000	11	Air-conditioning, finished work
54 (43)	Hokkai Ford Tractor (Sapporo)	23,340	-12.0	0.0	21,000	2	Agricultural machinery
55 (46)	Narazaki Industry (Muroran)	23,105	-9.5	0.0	26,240	3	Construction, air-conditioning machinery
56 (57)	Nippon Dendo Precision Machinery (Osaka)	23,023	25.2	0.0	27,000	12	Power transmission equipment, hydraulic and pneumatic tools
57 (58)	Mitsui & Co. Ltd. (Tokyo)	23,000	24.3	0.0	24,000	3	Construction, pollution prevention machinery
58 (62)	Mitsui & Co. Ltd. (Tokyo)	21,379	32.8	0.0	27,206	3	Machine tools
59 (60)	C. Itoh & Co. Ltd. Heavy Machinery Sales & Service (Tokyo)	21,000	20.0	0.0	24,000	3	Machine tools, industrial machinery
60 (59)	Nakayama Machinery (Osaka, East Osaka)	20,844	13.1	0.0	22,000	9	Machine tools
61 (67)	Ebara & Co. Ltd. (Tokyo)	20,613	40.2	0.0	21,000	9	Water equipment, pump
62 (66)	Shintoa Trading (Tokyo)	19,824	29.0	9.1	18,858	3	Construction machinery, machine tools
63 (63)	Printing Machinery Trading (Osaka, Neyagawa)	18,580	17.0	0.0	22,550	12	Printing machinery
64 (56)	Cherry Shoji (Tokyo)	18,369	-3.2	0.0	20,100	4	Camera, business machinery
65 (55)	Kyusho Construction Machinery Sales (Fukuoka, Tsukushino)	18,111	-11.4	0.3	19,756	3	Construction machinery, internal combustion engines
66 (70)	Sugimoto Shoji (Osaka)	17,759	25.5	2.5	20,000	9	Digital position indicator
67 (72)	Yazaki Sogyo (Tokyo)	16,744	33.8	3.2	19,560	6	Air-conditioning machinery

Rank	Firm name (head office location)	1980 actual sales volume	Growth rate	Export rate	1981 sales plan	Settlement term	Main items handled
68 (69)	Wakita (Osaka)	16,269	13.6	2.9	17,500	2	Construction machinery
69 (68)	Torishima Keesubi [phonetic] Trading (Osaka, Takagi)	16,203	11.8	16.4	17,500	3	Wind & hydropower machinery, general parts
70 (64)	Nakamichi Machinery (Sapporo)	16,132	1.7	0.0	16,549	1	Construction machinery, plant
71 (75)	Marubeni Fiber Machinery Sales (Osaka)	15,396	29.8	0.0	15,979	3	Fiber machinery
72 (65)	Kyoritsu Eko Bussan (Tokyo)	15,308	-1.3	0.0	15,400	9	Agricultural and forestry machinery, public welfare machinery
73 (61)	C. Itoh & Co., Ltd. (Tokyo)	15,000	12.8	100.0	27,300	3	General industrial machinery, chemical machinery
74 (71)	Glory Shoji (Osaka)	14,431	13.7	0.0	16,989	10	Coin handling machinery, vending machine
75 (80)	Yamato Science (Tokyo)	13,400	24.1	8.2	14,500	9	Physics & chemistry instrument, research and experimental instrument
76 (74)	Kobayashi Industry (Osaka)	13,394	11.9	12.2	11,380	10	Screws
77 (79)	Ueno (Tokyo)	13,131	20.4	2.3	15,000	3	Cutting tools, machine tools
78 (77)	Shinko Industry (Osaka)	12,415	9.6	4.3	13,000	12	Air-conditioning machinery
79 (84)	Katsuyama Machinery (Osaka)	12,173	22.4	3.9	13,000	8	Machine tools, load-handling machinery
80 (78)	Fukuhara Industry & Trade (Osaka)	11,321	2.8	53.2	--	5	Knitting machinery, parts
81 (81)	Chiyoda Machinery & Trade (Tokyo)	11,279	5.8	0.0	16,000	12	Machine tools, metal work machinery

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Rank	Firm name (head office location)	1980 actual sales volume	Growth rate	Export rate	1981 sales plan	Settlement term	Main items handled
82 (94)	Yachiyoda Industry (Tokyo)	10,600	65.6	--	17,200	6	Machine tools
83 (86)	OSG Sales (Aichi, Toyokawa)	10,592	28.8	3.6	11,500	11	Cutting, press, measurement tools
84 (82)	Toyo Ink Manufacturing (Tokyo)	10,474	-0.8	9.2	11,000	3	Printing machinery, machine parts
85 (83)	Toyo Commerce (Tokyo)	10,449	1.2	9.4	--	9	Construction machinery, ships
86 (76)	Itoman & Co., Ltd. (Osaka)	10,175	-11.0	50.0	12,484	9	Agricultural, fiber, construction machinery
87 (87)	Kodama Shoji (Osaka)	9,646	28.7	54.8	10,000	12	Tools, parts
88 (92)	Chiyoda Sales (Tokyo)	9,500	43.0	0.0	13,000	3	General industrial machinery
89 (89)	Toba Yoko (Tokyo)	9,374	34.1	1.3	10,393	9	Pneumatic, hydraulic control equipment
90 (91)	Gadelius [phonetic] (Tokyo)	8,760	29.3	0.0	9,760	12	Printing, packaging, construction machinery
91 (90)	Meisho Commerce (Tokyo)	8,620	24.8	94.1	10,000	9	Roller chain, rivet, screws
92 (88)	Newlong [phonetic] (Tokyo)	8,068	11.9	28.2	8,801	6	Special industrial sewing machine
93 (--)	Reybold [phonetic] (Tokyo)	7,406	46.2	0.0	8,000	3	Machine tools, industrial machinery
94 (100)	Matsushita Electric Trade (Osaka)	7,100	31.6	100.0	8,100	3	Camera, calculator
95 (93)	Shinwa Industry (Osaka)	7,056	10.1	0.0	--	9	Parts
96 (85)	Siemens (Tokyo)	6,721	-20.0	5.0	--	9	Transportation, communications machinery
97 (97)	Sakura Precision Machinery (Tokyo)	6,427	10.2	13.1	7,300	9	Medical instruments
98 (96)	Gunze Limited (Tokyo)	6,400	6.7	11.3	8,600	5	Fiber, medical, general industrial m.
99 (--)	Muranaka Medical Instrument (Osaka)	6,380	24.1	8.2	7,310	11	Medical instruments, chemical machinery
100 (98)	Hokuryo Heavy Machinery (Ishikawa, Komatsu)	6,375	10.8	0.0	6,400	9	Construction machinery

Growth Supported by the Popularity of NC, Yachiyoda and Reybold Made Rank; Semiconductors and OA Related Firms Give Good Fight

Sales Volume Growth Rate

Favorable conditions for machinery firms dealing in machine tools was outstanding from the results of this investigation. Yachiyoda Industry, Reybold, and Mitsui Machine tools which were near the top of the 1980 sales volume growth rate ranking, are specialty firms dealing in machine tools. The reason why these machine tool specialty firms did so well in 1980 was because there was a great desire to invest in equipment held by the manufacturers here and abroad, and to save labor from introduction of NC (numerically controlled) machine tools into their production process.

Moreover, Tokyo Electron, which experienced a favorable sales climate of semiconductor manufacturing equipment which constituted the driving force of "microcomputer revolution," and J. Ozawa & Co, which dealt in business machines which led the "OA age," were among the top ranking, sensitively reflecting the market activity of the business world. Large firms such as C. Itoh & Co and Sumitomo Shoji Kaisha have also expanded their sales through their powerful sales networks here and abroad. However, Chori Company, which came in first on account of a surge in plant orders, and Nissho-Iwai Aerospace, which came in second because of favorable sales of aerospace machinery, are considered to have experienced temporary growth. They are expecting a reduction in sales volume in 1981.

Inactivity in the sales of construction machinery as a result of slowdown in the public works and dullness in sales of agricultural machinery due to reduced interest in buying by the farmers influenced by the cool summer last year resulted in the fact that sales volumes of the firms dealing in this machinery could not grow. This was another feature which was shown very clearly by the results of this investigation.

1980 Sales Volume Growth Rate Top 20 Firms

Rank	Firm name	Growth rate (%)
1	Chori	111.5
2	Nissho-Iwai Aerospace	107.3
3	Yachiyoda Industry	65.6
4	Toyota Commerce	63.7
5	C. Itoh & Co., Ltd.	51.6
6	Reybold	46.2
7	Seika Industry	45.8
8	Chiyoda Industry & Sales	43.0
9	Tokyo Electron	42.6
10	Sugahara Industry	40.2
11	Nichimen Industry	37.7
12	Sumitomo Shoji	35.4
13	Toba Yoko	34.1

Rank	Firm name	Growth rate (%)
14	Ohzawa Shokai	33.9
15	Yazaki Sogyo	33.8
16	Mitsui Bussan Machine Tool	32.8
17	Toyo Menka Kaisha	32.2
18	Kyokuto Trading	31.7
19	Matsushita Electric Trade	31.6
20	Marubeni Fiber Machinery Sales	29.8

Increasing Foreign Dependency; C. Itoh & Co, Chori, and Nichimen Co Have Concern Over Friction in the Field

Machinery export occupies approximately 60 percent of Japan's total export (1980 Customs statistics). It constitutes the main breadwinner who is indispensable for paying the cost of importing the raw material and fuel such as oil and iron ores. In this investigation, we also requested the export volume and comment in relation to machinery export from a total of 27 firms, the vanguard of machinery firms whose export rate was more than 20 percent, in order to have an understanding of the 1980 export picture.

Among these 27 firms, there were 17 whose export rate was also more than 20 percent in the previous year. And, 12 of the 17 belonged to the "export dependent type" whose export growth rate exceeded its overall growth rate. The majority of the large consolidated firms increased the sales volume of their machinery departments by increasing export. This group was led by C. Itoh & Co which registered a very high export rate of nearly 80 percent.

On the other hand, those firms among the 27 which increased the sales volume by expanding their domestic sales numbered only seven including Kinsho-Mataichi Co, Toyota Commerce, and Mitsubishi Corporation. Machinery export could become "sparks" which ignite the trade friction in the Euroamerican countries, and the machinery firms heavily in export are conscientiously taking appropriate countermeasures such as "emphasizing technology export" (Kinsho-Mataichi) and "backing up the advance of manufacturers in the field" (Mitsui Corporation).

Export Rate

Ranking of machinery firms whose export rate exceeded 20 percent

Rank	Firm name	Export rate	Export growth rate	Total sales volume growth rate
1	Brother International	100.0	16.3	16.3
1	C. Itoh & Co. Machinery	100.0	12.8	12.8
1	Matsushita Electric & Trade	100.0	31.6	31.6
4	Meisei Commerce	94.1	24.8	24.8
5	Kinsho-Mataichi	90.8	12.7	13.5
6	C. Itoh & Co. Shoji	79.9	66.9	51.6

Rank	Firm name	Export rate	Export growth rate	Total sales volume growth rate
7	Chori	72.0	185.8	111.5
8	Nichimen Industry	68.7	46.9	37.7
9	Asahi Optical Shoji	63.4	2.2	-1.5
10	Marubeni	60.7	57.7	28.6
11	Kodama Shoji	54.8	57.2	28.7
12	Mitsubishi Shoji	53.0	18.5	26.4
13	Ohzawa Shokai	52.5	79.7	33.9
14	Sumitomo Shoji	52.0	38.1	35.4
15	Citizen Shoji	51.4	34.1	16.1
16	Itoman	50.0	-29.2	-11.0
17	Mitsui Bussan	48.9	32.5	19.0
18	Nissho-Iwai	48.2	36.1	25.9
19	Hattori & Co.	48.1	47.5	20.7
20	Toyo Menka Kaisha	45.9	56.3	32.2
21	Kanematsu-Gosho	45.2	39.3	21.6
22	Yamazen	43.8	54.6	24.5
23	C. Itoh & Co. Fiber Machinery Sales	41.2	-0.8	23.6
24	Kawatetsu Shoji	40.3	5.3	7.3
25	Ohkura Shoji	36.4	-8.5	7.4
26	Newlong	28.2	25.1	11.9
27	Toyota Commerce	25.2	43.9	63.7

Those firms which responded to the questionnaire but did not make the top 100:

Firm name (head office location, main items handled)

Kensetsu Fastener (Osaka, tools)
Nikkaki (Tokyo, medical instruments)
Muraki Watch (Tokyo, watch)
Western Trading (Tokyo, industrial machinery)
Nissei (Tokyo, drying machinery)
Kokusai Koki (Tokyo, machine tools)
Yamamori (Tokyo, tools)
Nippon Meyer (Fukui, fiber machinery)
Tominaga Bussan (Tokyo, marine internal combustion engines)
Sankin (Tokyo, tools)
Meiko (Tokyo, business machine)
Hasegawa Industry (Osaka, industrial machinery)
Koizumi (Tokyo, air-conditioning machinery)
George Fischer Machine Tool (Osaka, machine tools)
Kobundo (Osaka, printing machinery)
Motoya (Osaka, press machinery)
Ohshima Shozaburo Firm (Nagoya, tool)
Etsuda Commerce (Tokyo, resin molding machinery)
Teradyne (Tokyo, semiconductor testor)
Tokibo (Tokyo, medical instruments)

Tosho (Tokyo, water treatment machinery)
Taichi (Tokyo, watch)
CSC (Tokyo, oil supply equipment)
Parker Commerce (Tokyo, food machinery)
Okumura Machine Manufacturing (Osaka, industrial machinery)
Karl Zeiss (Tokyo, medical instrument)
Marubeni Electronics (Tokyo, semiconductor manufacturing equipment)
Yoshida Commerce (Osaka, fiber machinery)
Nodeson [phonetic] (Tokyo, painting machinery)
Maruichi Cutting Tool (East Osaka, tools)
Nichibei Automotive (Tokyo, automobile maintenance equipment)
Teisho Machinery Sales (Tokyo, measurement instrument)
Japan A M (Tokyo, printing machinery)
Shinko Trading (Tokyo, medical instruments)
Asia Industry (Tokyo, parts)
Kanematsu Industrial Machinery (Tokyo, plastic processing machinery)
Japan Focus (Tokyo, medical instrument)
Kawamada Chemical Industry (Tokyo, leather processing machinery)
Taiyo Bussan (Kobe, hydraulic machinery)
Yufu Precision Machinery (Tokyo, medical instrument)
Sanshin Electric (Tokyo, facsimile)

Furthermore, Mitsubishi Shoji Machine Tool (Tokyo, 1980 sales: 26,392,000,000 yen, main item handled: machine tools) was excluded from the group of subjects for top 100 ranking, because its response was received after the data was totaled. And Ohzuka Commerce (Tokyo, business machine) and Uchida Yoko (Tokyo, business machine) which were considered to be in the top 100 but were not included in the ranking because they declined to respond to the questionnaire.

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SCIENCE AND TECHNOLOGY

MITI STUDIES WAY TO AID BASIC MATERIAL INDUSTRIES

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 970 1 Sep 81 p 4

[Text]

The Ministry of International Trade & Industry has begun studying ways and means for shoring up the basic material industries, such as petrochemical, aluminum and paper-pulp, as all of them have become bogged down in managerial difficulties.

This is particularly so because more people have begun to feel that if the basic materials field is allowed to remain as it is, this may lead to undermining Japan's industrial structure in general.

Indications now are that the MITI's review will embrace two phases. One will concern medium- and long-term measures for coping with the high cost of energy and materials which form the basic factors for the business slump, and the other, short-term measures, such as abolishment of surplus facilities.

As for short-term measures, MITI is expected to consider such steps also as adding the petrochemical industries and others to the list of those which benefit from the law on aiding structurally depressed industries, and extending government funds for strengthening their competitiveness, such as by promoting research and development.

In June, 1978, the Government instituted a special emergency measures law for helping stabilize some industries which sorely were hit by a recession stemming from their structural composition.

The Government thereafter designated 14 types of industries to come under this law, such as open-electric furnace, aluminum smelting and synthetic fiber, and then systematically abolished their surplus equipment.

However, the competitiveness of the basic material industries began falling sharply in the period from 1978 to 1979 owing to the effects of the second oil crunch, and the structural depression of this sector further intensified as compared to around 1978.

For instance, the petrochemical industry, not designated under the law for structurally depressed industries, began newly to experience serious managerial difficulties.

Such a situation led MITI from this spring successively to convoke the aluminum and chemical industry committees of the Industrial Structure Council, advisory body to its minister, to consider relief measures on an individual industry basis.

With regard to medium- and long-term relief measures, MITI is expected particularly to study the high cost of energy and materials in Japan as compared to nations in the West after the second oil crunch.

As to this, its top officials fear that Japan's basic materials industries are destined to experience further trouble if the oil producing nations themselves begin oil refining and start selling their oil products since this will further bring down world prices of oil products and further widen the gap between them and Japanese prices.

It thus appears that MITI experts will explore the possibility of taking some kind of a governmental policy measure to lower prices of power and petroleum products, such as naphtha, used by the basic material industries.

With regard to starting a study of measures for shoring up the basic material industries, MITI says:

"Japan's processing type industries, such as general machinery and electric equipment, have strong international competitiveness, and are steadily stepping up their exports.

"However, in the back of such a favorable trend of the processing industries is the high technological level of the domestic suppliers of basic materials as well as their smooth supply.

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SCIENCE AND TECHNOLOGY

URANIUM ENRICHING PLAN TAKES ON CONCRETE FORM

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 969, 25 Aug 81 pp 1, 19

[Article by Kiyoo Suda]

[Text] Building of Japan's prototype uranium-enriching plant, to be followed by full-fledged commercial plants, has recently been agreed on by the Government's Science and Technology Agency, Ministry of International Trade and Industry (MITI) and the 10-company regional electric power industry in Japan.

The agreement signals progress in Japan's national policy of building its own "nuclear fuel cycle," to ensure an independent, lasting and adequate supply of nuclear energy, all the way from development of uranium resources through U-enriching, power generation, spent U-fuel reprocessing, to ultimate disposal of the radioactive nuclear waste materials.

The prototype plant is specifically aimed at making Japan at least 30 per cent self-sufficient in necessary supplies of enriched uranium 235 fuel for the existing 22 and other prospective commercial nuclear electric power stations, invariably of light water-cooled category, by the year 2000. The nation still totally depends on imports for such supplies.

According to the agreement, building of the prototype scheduled to start next year (during fiscal 1982) and its operation are to be undertaken by the governmental Power Reactor and Nuclear Fuel Development Corporation because of its long experience with its successful 1977-81 pilot U-enriching plant building-operation project.

This part of the agreement was significant as it came after a sharp split of views between the Agency, insisting on a totally private undertaking of the prototype project, and MITI and industry assuming the principal duty concerned because of the great expense of the project, although the latter compromised on the industry's partial bearing of the cost.

The prototype plant is to have an annual production capacity of 200 ton SWUs (separation work units) and is to be put into operation by fiscal April, 1990. The plant will be located at the same place as the pilot plant — Ningyo Pass in the hills on the border of Okayama Prefecture with Tottori Prefecture. (One ton/SWU is equivalent to one year's supplies of U-fuel for a little standard nuclear power plant of about 10,000 kilowatts in capacity.)

An estimated total cost of ¥70 billion to build the prototype plant will be "partly" borne by the electric power industry. The industry and the Science and Technology Agency are said to still disagree on the industrial share of the cost, with the Agency insisting on 50 per cent and the industry on 20 per cent.

Follow-up commercial plants are to be naturally built chiefly at the responsibility of the electric utilities (with the Government's financial assistance) and the companies are to create a joint company to work out a common plan to proceed with their own project. (The first commercial plant now visualized is to start operating by around 2000 with an annual capacity of 3,000 SWUs.)

The agreement has already been accepted as is by the Domestic Uranium Enrichment Subcommittee of the Government's Atomic Energy Commission into the commission's official recommendation to be filed with the Prime Minister's Office shortly. The Agency and the Ministry directly in charge of the project will accordingly seek the necessary appropriations under Japan's next fiscal 1982 national budget to be compiled by the year-end.

The uranium 235 fuel for Japan's N-power stations is made from yellow cakes (semi-refined) uranium ores enriched in its U-235 content to about 3 per cent. Such enrichment requires highly-developed technology and expensive facilities, and Japan has continued to seek the services of the U.S. and France to do the enriching since the start of the last decade. That has posed various problems to deter or endanger Japan's national policy in favor of continued development of its nuclear electric power generation. The U.S.-led international

policy against nuclear energy software and hardware proliferation to prevent military abuses has often prevented the progress of even Japan's peaceful nuclear energy utilization program through severe international checks, especially as to reprocessing of spent uranium fuel and creation of fast-breeder reactors to fuel themselves and supply fuel to other reactors. Besides, a possible shortage in international supplies of enriched uranium 235 could undermine Japan's whole long-range nuclear energy development program. Consideration of such basic vulnerabilities of the program has prompted the Japanese Government and industry to build up Japan's self-sufficiency in uranium enriching services as far and as early as possible.

Japanese electric power companies have been obtaining American and French uranium-enriching services under long-range commercial contracts now extending as far as to 1995. As the companies now figure, their expanding N-power station networks will come to need annually about 8,000 ton/SWUs of enriched uranium supplies by 1990, 10,000 by 1995, and 12,000 tons by 2000. Without Japan's own efforts to build up its domestic enriching capacity, they fear a possible shortage in such supplies to occur after 1995.

Japan now has only a token uranium-enriching plant in a little pilot plant with an annual capacity of only 50 SWUs built by the governmental corporation and put into a trial run in 1979, although the plant has proved a decided success in making the prototype plant project feasible.

CSO: 4120/324

SCIENCE AND TECHNOLOGY

TECHNOLOGY DEVELOPED TO MAKE CARBON FIBER FROM PITCH

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 970, 1 Sep 81 p 13

[Text]

A new method of producing a high-quality carbon fiber from oil or coal pitch at a far greater speed than any known process has been developed by the Government Industrial Research Institute, Kyushu.

According to the regional laboratory at Fukuoka, the new method also promises far lower production cost, possibly 50 per cent lower, than the conventional commercial method of producing carbon fiber from polyacrylonitrile (PAN) through baking.

Production of the item from pitch, a cheap material, had long been a subject of fierce technological competition among Japanese, American and other chemical makers, notably including Kureha Chemical Industry Co. of Japan, and Union Carbide Corp. of the U.S. But the strong tenacity of the raw material had limited the speed of production (drawing) to only scores of meters a minute. The slow speed has resulted in a product with a bad molecular arrangement and thus a low tensile strength, attaining only about a third of that produced from PAN.

The Fukuoka institute said its method can draw carbon fiber of a filament type at a speed of anywhere between 300 and 1,000 meters a minute, with a marked yield of 90 per cent or higher. The PAN method had been incapable of producing filaments and attaining more than 50 per cent in yield. The carbon filaments produced by the new method are about as tensile as that producible by the conventional method, withstanding a stress of about 300 kilograms per square millimeter.

The regional institute said its method accidentally resulted from its research job of developing Japan's own Solvolysis method of liquefying coal. That method is to separate coal into oil by a chemical reaction caused in a mixture of dust coal and oil-refining residues, like pitch. But even such residual matter has recently gone up in price and also come to be used for different purposes to make the Solvolysis method more impracticable in cost terms.

The institute thus reduced its consumption of such oils by recycling the heavy oil residue resulting from hydrogenation of pitch or other oil refining residues and distillation.

Such technological efforts to reduce the raw material cost led to application of tetrahydroquinoline (THQ) as a good coal solvent that keeps the dissolved coal in a low molecular condition, instead of polymerizing, into a high molecular carbonic solid.

Such merit of THQ was utilized by making pitch react with THQ at a temperature of about 400 degrees C. to obtain a low molecular pitch solution, which was briefly heated at a temperature of about 500 degrees C. under a decompressed atmosphere.

The resultant intermediate product was a premesophase matter that stays the same in character regardless of moving directions in physics terms (as seen in crystals and other solids.) The filaments were spun out of the intermediate product at a great speed and after being heated in the ordinary atmosphere for their surface oxidization and insolubility, the filaments were heated while being pulled taut into the final product in a good crystalized condition.

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SCIENCE AND TECHNOLOGY

MORE EFFECTIVE USE OF BYPRODUCT WASTE GAS IS SEEN BY MITI

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 969, 25 Aug 81 p 5

[Text]

Byproduct gas of steel mills and chemical plants, as obtained in the process of coke production from coal, will be better utilized if and when the Ministry of International Trade & Industry fully develops measures to encourage it. MITI is considering financial assistance, including subsidies, and technological development to raise the coal gas's calorie so that the so-called coal gas can be more widely utilized. The MITI measures will be intended to double the annual coal gas use to 10 million liters a year by fiscal 1990.

The gas utilization examples include the joint construction of an experimental plant by Osaka Gas Co. and Nippon Steel Corporation's Sakai works. Kawasaki Steel Corp. is considering making its gas at Mizushima works available to interested users in the area.

According to MITI, 5 million kiloliters of coal gas is currently utilized a year outside coke plants — mostly as fuel for electric power generation in and near steel mills. About 4 per cent (200,000 kiloliters) is supplied to local gas utilities for production of city gas, as exemplified by Kamaishi works of Nippon Steel and Fukuyama works of Nippon Kokan K.K. Steelmakers are promoting coke utilization in an attempt to decrease reliance on expensive fuel oil. That will tend to raise byproduct gas output, which MITI thinks can be better utilized.

Its idea is that the gas should be used more for city gas production, which generally relies on liquefied natural gas and liquefied petroleum gas. The LNG and LPG supplies are not necessarily stable.

Coal gas's disadvantages include lower calorific value — about one half of LNG — and an unstable supply as it depends on the steel mill's operating rates. Precisely for these reasons, most of the gas currently is consumed by steel mills' power plants.

In October, 1980, however, Osaka Gas and Nippon Steel set up a pilot plant for methanation of coke byproduct gas. The gas methanation is intended to raise the calories. The pair plans to raise the plant's capacity in or after 1984.

MITI sees it possible for the gas to be supplied to steel companies' subsidiaries and affiliates operating near the steel and coke plants. It is also studying the possibilities of the chemical industry's using the gas as a feedstock, as exemplified by the plan of Tokyo Gas Co. and Showa Denko K.K. for ammonia production. Its technical studies include methods to raise gas calorie supply by means of town gas pipes and reducing transportation costs by installing pipes exclusively for coal gas.

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SCIENCE AND TECHNOLOGY

BOEING CALLS FOR QUICK DECISION ON B7-7 PLANE PROJECT

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 969, 25 Aug 81 p 6

[Text]

Boeing Co. of the U.S., through its Boeing Commercial Airplane Co. division, last week invited Japanese aircraft makers to cooperate in developing a civilian transport series of 150-seater class. Boeing apparently acted in competition with a similar approach made the week before by McDonnell Douglas Corp. of the U.S. and Fokker B.V. of the Netherlands.

Boeing's approach to Japanese aircraft producers was made by Thomas J. Bacher, director for International Business Planning of BCAC, when he met company executives at Tokyo's Aviation Building. Executives of Mitsubishi Heavy Industries, Ltd. and two other companies and also leaders of Civil Transport Development Corp. (CTDC), a Tokyo association of aircraft and engine makers attended.

Bacher later disclosed in his interview with the Nihon Keizai Shimbun in Tokyo that his company is ready to accept any Japanese aircraft company in the proposed B7-7 series development project "on an equal partnership basis." He had made it clear in the meeting that BCAC wishes to conclude by early September, if possible, a "memorandum of understanding (MOU)" with Japanese companies.

Details of his talks were not disclosed, but, according to informed sources, Bacher did not refer to what was believed to be stiffer conditions set by Boeing than the equality offered by the McDonnell Douglas-Fokker team. He said nothing about demanding a special charge for allowing the Japanese to use the Boeing Co.'s international commercial goodwill to sell the prospective planes. However, Boeing was still reportedly insisting holding somewhat greater advantages than the Japanese in the project.

CSO: 4120/324

SCIENCE AND TECHNOLOGY

NISSAN TO INSTALL MANY ROBOTS AT PICKUP FACTORY IN TENNESSEE

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 969, 25 Aug 81 p 7

[Text] Nissan Motor Co. will employ a large number of industrial robots at its pickup truck factory now under construction in Tennessee. The use of robots is seen as a vitally important step in maintaining product quality at the same high level as in domestic production.

Japan's No. 2 automaker envisions installing 210 robots at the U.S. factory, with an eventual aim of attaining a 95 per cent automation ratio in welding processes there.

The Tennessee factory, designed to produce 10,000-15,000 trucks a month, will thus become the most advanced in the world automobile industry in terms of plant automation.

Even in Japan, for example, an automaking plant with a monthly capacity of more than 30,000 vehicles now uses 100-150 robots at the most.

Behind Nissan's decision in April, 1980 to launch U.S. production was the company's confidence that it could operate with high efficiency and produce high quality trucks by building an extremely modern factory equipped with industrial robots.

In the summer of 1980, the company set up a subsidiary, Nissan Motor Mfg. Corp. U.S.A., while buying an 850-acre site in Smyrna in the suburbs of Nashville to build the pickup factory.

The Tennessee plant, estimated to cost $500 million, is scheduled to begin full operations in the fall of 1983 on an integrated basis. It will employ 2,200 workers.

Specific moves of Nissan to install robots at the U.S. plant have already started. The company has ordered 71 spot-welding robots from Kawasaki Heavy Industries, Ltd., 55 arc-welding robots from Osaka Transformer Co., and 36 robots from Switzerland's Tralfer.

Besides, Nissan will purchase four to five robots from outside for educational training of indigenous workers. These robots will be high efficiency ones having an action freedom degree of five to six axles.

Moreover, the company will send to the U.S. factory 50 welding robots developed at its domestic plant in Yokohama. These robots, having less than 4 axles, can engage in relatively easy welding jobs.

A Nissan spokesman said, "Our American truck factory will be able to remove the lack of uniformity in quality."

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SCIENCE AND TECHNOLOGY

SEARCH FOR NEW COAL CHEMISTRY PRODUCTS INTENSIFIES

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 969, 25 Aug 81 p 9

[Text] The race to develop new coal chemistry products in Japan has intensified.

It features attempts not only to develop various coal gas, tar, or tar-based new products but to develop the so-called C-1 products.

The latter are various basic industrial chemicals including ethanol, acetic acid, ethylene glycol, and high alcohal out of materials containing only one molecule of carbon to be obtained by removing carbon monoxide or miscellaneous gases from gasified coal, a heavy type of oil, tar sand, or from the steelmaking by-product gasses.

Mitsubishi Chemical Industries, Ltd. has developed an innovational coal fiber, just as strong, elastic and otherwise good as the conventional petrochemical types of synthetic fibers, and much less costly to produce. The company is technologically sure it will be able to start full-scale commercialization of the new product by around 1985.

The carbon fiber is the company's second new product in the area of carbon engineering. The company plans to start shortly a follow-up research-development project to develop its third new products (a group of new products), specifically; new industrial intermediate materials of very high efficiency by combining the carbon fiber or some other carbon products with metals, plastics, and other items.

Nippon Steel Corp., Nippon Steel Chemical Co., and Nittetsu Chemical Industrial Co. (the latter two are chemical-making subsidiaries of Nippon Steel) have started a research and development project by creating a joint chemical research center early last July in Nippon Steel's basic research institute at Kawasaki City.

The trio's move represents a significant policy drive of the largest Japanese steelmaker to develop a big general chemical industry division. The research center will study four themes: 1) Development of new carbon-based industrial materials; 2) Development of new C-1 chemistry products based on steelmaking by-product gases; 3) Development of carbon-based compound industrial intermediate products; 4) Development of new inorganic industrial materials, including ceramic types.

As for Ube Industries, Ltd., it plans to build this year to next a coal gasifying plant in the factory, at Ube City, of its subsidiary, Ube Ammonia Industry Co.

Chiefly intended for supplying gasified coal to the factory to replace the latter's use of naphtha as the raw material, the plant is expected to cut down the factory's production cost by 20 to 30 per cent for a higher international competitive capacity. Ube Industries, as one of the Japan's most versatile general chemical developers, could go far into the new coal chemistry product development by utilizing the plants.

CSO: 4120/324

SCIENCE AND TECHNOLOGY

ADVISORY BODY REPORTS ON DATA CIRCUIT LIBERALIZATION

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 970, 1 Sep 81 p 3

[Text]

Limited liberalization of data communications circuits was recommended last week by an advisory body to the Minister of Posts & Telecommunications. However, it called for retaining to a large extent the Ministry's control over data circuits and the private data communications industry.

Data communications, which links computers with input and output terminals, is the third communications means after telegraph and telephone. But data circuits in Japan have been monopolized by the governmental Nippon Telegraph & Telephone Public Corp. (NTT). The Ministry of International Trade & Industry and the business community long have been criticizing that the monopoly is hindering the progress of data communications in Japan.

The advisory organ recommended "liberalizing in principle" joint use of leased lines by private businesses. Joint use is now "prohibited in principle."

However, the recommendation called for NTT's continued control on the private data communications industry's subleasing of leased lines to a third party. In the case of data communications on subleased lines involving no "message exchange," the data communication company will be required to notify its business to the Minister of Posts & Telecommunications. In case it involves "message exchange" (as in the case of telephone), the data communications company must get a license from the Minister, who will check whether the company ensures secrecy of communications, protects users and maintains high technical standards.

MITI and the business community already have expressed a strong dissatisfaction with the NTT's continued intervention in the private data communications industry, saying that it is apparently intended to curb competition with NTT.

However, the Ministry of Posts & Telecommunications plans to formulate a "data communications bill" on the basis of the recommendation and submit it to the next general Diet session. Rough going is expected before it will become a law.

CSO: 4120/325

GREEN CROSS TO PRODUCE B VARIETY HEPATITIS VACCINE

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 970, 1 Sep 81 p 13

[Text]

Biogen S.A. and Green Cross Corp. have reached an agreement on having the Swiss genetic engineering firm provide the Osaka drug firm with production technique for B-type hepatitis vaccine. The genetic engineering technique is expected to help realize mass production of the vaccine from manipulated gene in E. coli.

Green Cross is undertaking clinical tests of its vaccine obtained from the human blood. But its conventional technique has drawbacks, such as growing difficulties to obtain blood and need of highly sophisticated centrifuge machines for vaccine purification.

By comparison, the microorganism can multiply to 100 billion only in a half day, paving the way for vaccine mass production. Protein that acts as antigen will be mass produced by genetic engineering technique so that it helps form antibody in the human body. The vaccine can help prevent infection.

The Green Cross-Biogen vaccine pact was scheduled to be finalized by early in September.

For the Japanese drug company, the tie-up with the Swiss firm is the third genetic engineering agreement. In February, this year, it finalized an interferon deal with Collaborative Research of the U.S. and an alubumin pact with Genex Inc., also of the U.S.

The Ministry of Health & Welfare says that hepatitis patients total about 130,000 in Japan, including 4,000 suffering from liver cancer and 36,000 who contracted hepatocirrhosis. A hepatitis vaccine development is also planned by the Science & Technology Agency.

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SCIENCE AND TECHNOLOGY

INTERFERON, HORMONES MADE WITHOUT USE OF BLOOD SERUM

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 969, 25 Aug 81 p 16

[Text]

A new method of artifically culturing human cells to have them produce interferon, hormones and other important medical substances without the normally required expensive cattle fetal blood serum has been developed by a team of Japanese national university researchers.

The method, which will also simplfy the complex refining processes in producing interferon and other drugs from human cells, and also eliminate the danger of cattle blood albumen straying into such drugs to cause fatal rejection, has been completed by Prof. Isao Yamane and his team at the Research Institute for Tuberculosis and Cancer of Tohoku University.

According to Prof. Yamane, he and his team will announce the new achievement at an international molecular biology symposium opening in the U.S. on September 1.

The achievement reportedly is a breakthrough in that it promises an answer to one of two big technological problems in modern tissue culture for production of valuable medical substances. Tissue culture to extract some of the cells of a living thing (including human beings), makes the extracted cells multiply massively through artificial nourishing. They then produce the wanted drugs and other substances through natural biological synthesis, one of three different processes of modern biotechnology. The other two are gene recombination and cell fusion.

But the culture of human cells, ideal for producing human drugs, has posed two tough technological challenges. One is the need for sufficient supply of the very expensive and troublesome cattle fetal blood serum, without which human cells can not be artifically cultivated.

However, the other challenge still remains — the growth of human cells under artificial culture not horizontally but three-dimensionally as seen in the body, to display their full-scale drug-producing functions. Cancerous human cells grow both horizontally and vertically, but when using cancerous cells, a great deal of trouble is needed to separate their nucleic acid and proteins to prevent the danger of every cancer-causing factor getting into the drugs to be produced.

How to make normal human cells grow three-dimensionally is still a difficult problem. The new job done by the university team could be highly evaluated as providing a clue to solving the question of how human cells multiply under artificial culture. But it would still require the development of many good culture nutrients and growth simulants, including hormones, and further development in applicability to different kinds of human cells before becoming widely usable. The new method is still limited to a few kinds of cell like the lymphoblast and fibroblast.

According to Prof. Yamane, he and his team have discovered why the cattle fetal blood serum has been indispensable for artificial culture of human cells. The answer is that a certain kind of fatty acid sticking to the albumen of that serum has a special function to help the multiplication of human cells. This kind of fatty acid has been identified as a combination of linoleic acid and oleic acid, the same kinds of acid as those easily obtainable at low cost from edible vegetable oils like sesame and soybean.

Such acids taken from vegetables cannot immediately be applied to human cell cultures because of their toxicity to such cells in direct and massive contacts. However, when such acids were wrapped up with a sort of polysaccharoid of circular atomic

structure, known as alpha-cyclodextrine and added to the culture solution, human lymphoblast and fibroblast were found to grow just as well as when nourished with the cattle fetal blood serum.

An interferon expert of Green Cross Corp., Osaka, has placed big hopes on the new achievement as a potential answer to dual problems of expense and animal blood alubumen danger in the conventional method of culturing human cells.

Prof. Yamane said the new method is applicable to the production of not just interferon, but that of sex hormones and other complex-structure hormones. He even visualized massive culture of human liver and skin cells to make ideal artificial livers and skins free from physiological rejection.

The tissue culture, if successfully developed through such innovations, could supersede the now glamorous gene recombination technology for its versatility including production of a perfect form of interferon compared with the latter's production of only the proteinous phase of interferon.

CSO: 4120/324

SCIENCE AND TECHNOLOGY

BRIEFS

ENERGY-SAVING SMELTING TECHNOLOGY--Showa Aluminium K.K., a major aluminum roller-processor, has developed a high-purity aluminum smelting method that enables a 20 per cent reduction in energy cost compared to the conventional electrolytic cell smelting process. The new smelting method, labelled Corjunal, is based on the principle that higher-purity aluminum first solidifies during the melting process. It uses no electricity but fuel oil for melting aluminum materials. Showa Aluminium already has built a 250-ton-monthly capacity pilot plant at its Sakai works and is scheduled to start building a mass production plant this fall for completion next spring. The plant will be capable of producing 2,500 tons yearly of high-purity aluminum ingots. Upon start-up of the new plant, Showa Aluminium will become the No. 2 producer of high-purity aluminum ingots in Japan after Sumitomo Aluminium Smelting Co. [Text] [Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 970, 1 Sep 81 p 6]

CSO: 4120/325

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