

## MECHANIZATION OF FISHING FLEETS IN JAPAN

by

S. Takayama

Chief, Fishing Gear and Method Division, Tokai Regional  
Fisheries Research Laboratory, Tokyo, Japan

The mechanization of fishing fleets is a subject-matter which Japanese Government has taken up as one of its important policies, since it greatly contributes not only to Japanese fishery development but to alleviation of crew's overwork, prevention from disaster, stabilization of fishermen's income, etc.

In our country, the fishermen who are engaged in coastal fisheries by small type fishing fleets occupy the greater part of total fishermen engaged in Japanese fisheries; and the coastal fishermen's income is generally lower than that of high sea fishermen. Accordingly, laying stress on the mechanization of small type fishing fleets in view of the modernization of our fisheries, we are making great efforts for attaining the above object which requires the settlement of problems technically or economically.

It is conceivable to be very opportune that IPFC has taken up the problem on "Development of Mechanized Fishing Fleets" and arranged the Symposium for realizing successfully the development of mechanized fishing fleets in respective regions based on each country's experience exchanged.

In our country, it was 1905 that fishing vessels were first fitted with engines. This experience made us know that the use of engines to fishing vessels was helpful not only for alleviation of crew's overwork or prevention from disaster but for fishing operations. Afterwards, Japanese fishermen, fishery entrepreneurs and fishery experimental institutions had the eagerness to study or test on the use of engines for craft; our machinery makers also kept in step with above fishermen, etc. to develop or improve on engines for craft.

Until a recent date, there was a tendency that fishing vessels had electric ignition engines, semi-diesel engines and diesel engines in cases of less than 10 G.T., 10 to 50 G.T. and more than 50 G.T., respectively.

As of the end of 1960, powered vessels numbering 163,000 were engaged in operation on sea or inland waters. Small type fishing vessels of less than 10 G.T. numbered 150,000 out of above 168,000.

As main factors by which powered vessels were increased in Japan as above-mentioned, beside a general background that the use of engines to fishing vessels brought about a good effect to the fishermen, fishery entrepreneurs and crew, the following factors are mentioned:

- (1) -- With the advanced technique for making engines, the engines of good quality fit for each type of craft were produced and supplied at low prices;
- (2) -- Japanese Government took direct or indirect measures to drive forward the motorization of craft.
  - (a) -- Governmental encouragement for motorization of fishing vessels,
  - (b) -- Technical guidance by "Fisheries Experimental Stations",
  - (c) -- Establishment of fishery financial system covering equipment funds,
  - (d) -- Training of mates and engineers for powered vessel,
  - (e) -- Aids for consolidation of fishing ports as safety fishing base,
  - (f) -- Smooth marketing of fishery products and the like.

In old days, Japanese fisheries were chiefly made up of conventional coastal fisheries by non-powered vessels; beach seine and fixed net fisheries only were mentioned as large-scale fisheries.

The enlargement of powered fishing fleets produced the gradual modernization of fishery types as well as the possible development of the fishing grounds which were not available because of lacking in powered fishing vessels. As a result of above-mentioned, the fishcatch level went on rising gradually.

Recent conspicuous features of the engines for fishing vessels are as follows:

- (1) - Notable advance of motorization for the small type fishing vessels which were comparatively behind in motorization,
- (2) - Economy in fuel expenditures increased HP per capacity, improved engine-qualities aiming at an advanced operation efficiency, etc.

Above all, it is notable that the engines for any fishing vessels including those less than 10 G.T. have rapidly been replaced with diesel engines.

Diesel engines, as compared with electric ignition engines or semi-diesel engines, have good merit points as follows:

- (1) - Greater HP per G.T.,
- (2) - Much lowering of fuel cost,
- (3) - Simplified handling and few mishaps to engines,
- (4) - Economy in personnel, etc.

Below-mentioned are the causes why the rapid spread of diesel engines has been brought about:

- (1) - Manufacturing technique of diesel engines for small type craft has rapidly been developed since the War and,
- (2) - Excellent diesel engines have been produced; for fit for small or middle type fishing;
- (3) - Supply prices have become lower.

Beside the replacement with diesel engines as above-mentioned, in recent years there is the popularization of engines and related machinery for fishing vessel such as superchargers, exhaust impulse system diesel engines, controllable pitch propellers, etc. These engines and related machinery are now in use only for large type craft, the advantages of which have already been proved; those for small type fishing vessels will be made with the development of manufacturing technique in the future.

Besides above-mentioned, outboard motors are in general use for small type fishing vessels.

The mechanization of fishing fleets has greatly contributed to alleviation of crew's overwork, stabilization of fishcatch, and also is attached importance too from a new angle of view due to Japanese recent economic situation. In our country, the mining and manufacturing as well as service industries have recently developed, as a result of which the problem of crew shortage has occurred with the increased demand for labor force needed for those industries.

Therefore, the the mechanization of fishing operation is now required very much. Because, on one hand, fishing operations are to be conducted by a fewer crew members per vessel; on the other, working conditions are to be made comfortable, and required crew members are to be secured by the income per crew member being raised, etc. That is, Japanese fisheries are obliged to maintain fishery productivity with a fewer working people.

Since end of the War, keeping pace with motorization of fishing vessels, fishing machinery and fishery-related machinery or installations of various kinds have notably developed above all; at the same time, concerned studies and researches are being developed.

As fishing machinery, for instance, there are net haulers, line haulers, trawl winches, winch drums, etc. The fishing vessels more than middle type at least have been equipped with the machinery fit for each fishery type and also the machinery for small type fishing vessels is beginning to be manufactured and supplied.

The fishing machinery in the past was due to motor driving in case of large type craft; belt

driving through intermediate shafts from main or auxiliary engines in case of small type craft. Recently, the hydraulic motor drive by oil pump has appeared, and this drive is commencing to be utilized for fishing vessels.

As fishery-related machinery or installations, for instance, there are radio communication sets, radars, lorans, fish finders, range finders, direct finders, radio buoys, net zonde, power blocks, refrigerators, etc. These machinery and installations are fitted to almost all large type craft and used effectively for fishing operations. For example, radio communication sets are very helpful not only for safety navigation of fishing vessels but for fishing operations, location of fishing grounds, availability of market conditions, etc.; especially same sets are indispensable for collective fishing operations.

Of late years, V.H.F. telephone sets of small type are beginning to be fitted to small type fishing vessels, and also V.H.F. radio telephone land stations of cooperatives have been established in fishing villages.

As for fish finders, many types of them are being supplied according to ship-types or uses; in addition, small type fish finders are now being supplied and in general use for small type fishing vessels with the development of transistors.

As for power blocks, small types of them are likely to come into use with a view to the economy in crew members per coastal fishing vessel.

Above-mentioned engines and machinery and installations for fishing vessel which have been used up to this time, were manufactured at the beginning for use of large type craft; and it is afterward that those engines, etc. were developed for small type craft.

In conclusion, the Japanese Government is continuing to make efforts in order to mechanize the small type fishing fleets, laying stress on the spread to fishermen of the fishing machinery and fishery-related machinery or installations which are simplified, small sized and economical.

**TABLE 1**  
Transition of powered fishing vessels and catches

Years	Number of powered vessels	Total fish-catches	Years	Number of powered vessels	Total fish-catches
	1,000 boats	1,000 tons		1,000 boats	1,000 tons
1912	1	1,649	1938	68	3,677
1913	2	1,974	1939	72	3,681
1914	2	1,977	1940	75	3,526
1915	3	2,032	1941	69	3,833
1916	3	2,206	1942	71	3,601
1917	3	1,969	1943	73	3,356
1918	3	1,842	1944	68	2,458
1919	4	2,249	1945	57	1,824
1920	6	2,482	1946	60	2,107
1921	6	2,177	1947	88	2,285
1922	7	2,450	1948	106	2,518
1923	9	2,475	1949	120	2,761
1924	11	2,626	1950	129	3,373
1925	13	2,843	1951	129	3,930
1926	16	3,071	1952	131	4,823
1927	21	3,248	1953	135	4,598
1928	25	3,096	1954	139	4,541
1929	31	3,129	1955	144	4,907
1930	36	3,186	1956	152	4,772
1931	42	3,376	1957	157	5,407
1932	45	3,556	1958	165	5,506
1933	49	4,064	1959	171	5,884
1934	53	4,272	1960	168	6,192
1935	57	3,977	1961	178	6,287
1936	62	4,330	1962	188	6,397
1937	66	4,041			

**TABLE 2**  
Transition of total number of fishing vessels  
(Unit: 1,000 boats, 1,000 tons)

Years	Total Number	Tidal waters fishery				Non-tidal waters fishery				
		Powered vessels			Non-powered vessel		Powered vessels		Non-powered vessel	
		Total tonnage	0-5 ton vessel number	0-5 ton vessel tonnage	Number	Tonnage	Number	Tonnage	Number	Tonnage
1956	150	1,209	123	222	237	237	2.2	3.1	27	13
1957	155	1,340	128	230	220	217	2.4	3.4	26	12
1958	162	1,393	136	244	209	207	2.6	3.6	25	11
1959	167	1,456	143	258	211	204	2.8	3.8	18	9
1960	195	1,564	142	259	195	177	2.9	3.9	17	8.7
1961	173	1,758	154	279	201	174	3.0	4.1	18	9.4
1962	189	1,853	164	296	195	168	3.4	4.5	17	8.8

**TABLE 3**  
Replacement with diesel engines of small type fishing vessels less than 5 gross tons  
(Unit: 1,000 boats)

Year	Total number of vessels	Ratio of fishing vessel with diesel engines
1953	106	7.6
1955	115	12.3
1958	136	27.0
1960	142	41.0
1961	154	48.0
1962	164	54.0

TABLE 4  
Composition of powered fishing vessels on tidal waters, 1962

Size of Vessels (ton)	Diesel				Hot-bull				Electric ignition							
	No. of Vessels		Gross tons		No. of Vessels		Gross tons		No. of Vessels		Gross tons		No. of Vessels		Gross tons	
	No. of Vessels	%	Gross tons	%	No. of Vessels	%	Gross tons	%	No. of Vessels	%	Gross tons	%	No. of Vessels	%	Gross tons	%
0-0.9	14,964	14.2	11,651	0.9	431	1.6	346	0.2	431	1.6	346	0.2	25,237	42.8	18,050	24.4
1-2.9	60,808	59.7	109,761	7.9	6,902	25.4	14,407	6.2	6,902	25.4	14,407	6.2	32,173	54.5	49,963	67.6
3-4.9	14,483	14.1	55,844	4.0	7,861	29.0	31,671	13.6	7,861	29.0	31,671	13.6	1,323	2.2	4,730	6.4
5-9	3,375	3.3	24,452	1.7	4,506	16.6	34,452	14.8	4,506	16.6	34,452	14.8	172	0.5	1,139	1.6
10-14	956	0.9	11,779	0.9	2,886	10.7	36,883	15.8	2,886	10.7	36,883	15.8	-	-	-	-
15-19	719	0.7	13,141	1.0	2,613	9.6	47,275	20.3	2,613	9.6	47,275	20.3	-	-	-	-
20-29	720	0.7	20,369	1.4	958	3.5	25,343	10.9	958	3.5	25,343	10.9	-	-	-	-
30-49	2,139	2.1	84,452	6.1	800	2.9	31,034	13.4	800	2.9	31,034	13.4	-	-	-	-
50-99	3,174	3.1	252,907	18.2	170	0.7	11,031	4.7	170	0.7	11,031	4.7	-	-	-	-
100-199	394	0.4	58,848	4.2	2	0	236	0.1	2	0	236	0.1	-	-	-	-
Over 200	850	0.8	746,250	53.7	-	0	-	-	-	0	-	-	-	-	-	-
Grand Total	102,582	100.0	1,389,454	100.0	27,129	100.0	232,678	100.0	27,129	100.0	232,678	100.0	58,905	100.0	73,882	100.0

TABLE 5  
Transition of fishing vessels by type of engine (Number of vessels)

At the end of	Total			Steam		Diesel		Semi-diesel		Electric ignition	
	Total	Steam	Diesel	Semi-diesel	Electric ignition	Semi-diesel	Electric ignition	Semi-diesel	Electric ignition		
1950	127,566	60	5,336	48,458	73,212	48,458	73,212	48,458	73,212	48,458	73,212
1951	127,296	46	8,629	46,955	71,666	46,955	71,666	46,955	71,666	46,955	71,666
1952	129,048	45	9,301	47,426	72,276	47,426	72,276	47,426	72,276	47,426	72,276
1953	133,203	43	11,592	46,493	75,075	46,493	75,075	46,493	75,075	46,493	75,075
1954	137,125	35	14,425	46,675	75,990	46,675	75,990	46,675	75,990	46,675	75,990
1955	142,265	33	19,380	45,987	76,865	45,987	76,865	45,987	76,865	45,987	76,865
1956	149,930	41	24,274	45,539	80,096	45,539	80,096	45,539	80,096	45,539	80,096
1957	154,560	46	33,705	43,202	77,607	43,202	77,607	43,202	77,607	43,202	77,607
1958	162,090	42	43,621	41,812	76,615	41,812	76,615	41,812	76,615	41,812	76,615
1959	167,743	42	52,927	39,222	75,553	39,222	75,553	39,222	75,553	39,222	75,553
1960	165,602	49	67,253	34,591	63,709	34,591	63,709	34,591	63,709	34,591	63,709
1961	178,048	49	85,372	30,757	61,868	30,757	61,868	30,757	61,868	30,757	61,868
1962	188,654	38	102,582	27,129	58,905	27,129	58,905	27,129	58,905	27,129	58,905

Note: Powered fishing vessels on tidal waters.