GOLDEN JUBILEE 1929-1979 ICAR

Fish technology newsletter

Vol. II No. 3 SEPTEMBER 1979

Inauguration of CIFT's Lab-to-land programme at Madras. (left to right) Thiru C. Chellappan, Director of Fisheries, Tamilnadu, Shri. G. K. Kuriyan Director of CIFT, Thiru G. Thirumal, Commissioner and Secretary, Department of Forest and Fisheries, Tamilnadu and Thiru G. R. Edmund, Food Minister, Tamilnadu.

CENTRAL INSTITUTE OF FISEHERIES TECHNOLOGY
MATSYAPURI P. O. COCHIN - 682029

CONTENTS

Foreword

Fish Technology Newsletter issued every month is intended to bring the fishery industry in India in touch with some of the important developments in fisheries technology resulting from investingations carried out at this Institute and elsewhere. It is not a research publication. Every effort has been earnestly made to express the ideas in non-scientific language. Its ultimate aim is the application of the results of contemporary research for the advancement of our fishery industry.

Fish Technology Newsletter does not owe allegiance to any manufacturer, patent, product or development agency unless otherwise specified. Its purpose is to open up a communication channel through which useful ideas can be exchanged, problems discussed and success shared. The process of exchanging views and opinions makes it easier to identify the real issues and that is where problem-solving begins.

We welcome contributions from any source which will help to achieve our above-mentioned aim. The sources of all such contributions will be acknowledged. We sincerely hope that the current events and informations contained in the columns "GLEANINGS FROM OTHER JOURNALS" and "LET'S TALK IT OVER" will be of interest to the Indian fishing and fish processing industries.

We also welcome suggestions from our readers for improvement in the contents and get-up of Newsletter. Any part of this publication may be reprinted in any language if the translation is true and the source is acknowledged.

Abbreviation : Fishtech News

Editorial Committee.

LAB - TO - LAND PROGRAMME

OF CIFT - 6

One of the highlights of the Golden Jubilee celebrations of the Indian Council of Agricultural Research being observed this year is a country - wide programme of transfer of Technology known as the Lab - to - Land programme to which CIFT is also contributing in a humble way. In the previous issues we published reports on such programme held at Mangalore, Bombay, Kumarakom, Calicut, Kumbalam and Vaikom. In this issue we present a report on a two - week training programme held at Madras.

Icing and packing of fresh fish in insulated containers for transportation of Fish

A two-week training course on fish processing was organised by CIFT at Chetput Fish farm in collaboration with Tamilnadu Department of Fisheries.

Inaugurating the Training programme on Sept. 20, 1979, Tamilnadu Food Minister, Thiru G. R. Edmund, stressed the need for making available to small fishermen Laboratory research data on processing, preserving, handling and transporting of marine products.

Thiru Edmund said that the training programme would help improve the socio-economic conditions of small Fishermen by teaching them modern methods of preserving and processing their catch.

Presiding over the inaugural function, Thiru G. Thirumal, Commissioner and Secretary, Tamilnadu State Department of Forests and Fisheries, said the State Fisheries Corporation had introduced, on an experimental basis, 10 fibre glass boats in some places in Thanjavur, Ramnad, etc. These had been given to poor fishermen at 50 per cent loan. The State Govt. had plans to organise a net work of ice plants and cold storage units along the coast, from Kanyakumari to Madras. These would enable fishermen to increase the returns on their catch from the present Rs. 3.50 per kg to Rs. 5.50.

Cutting of Thermocole for insulating fish containers.

CIFT Director, Shri. G. K Kuriyan said the training course would cover three aspects of fisheries.

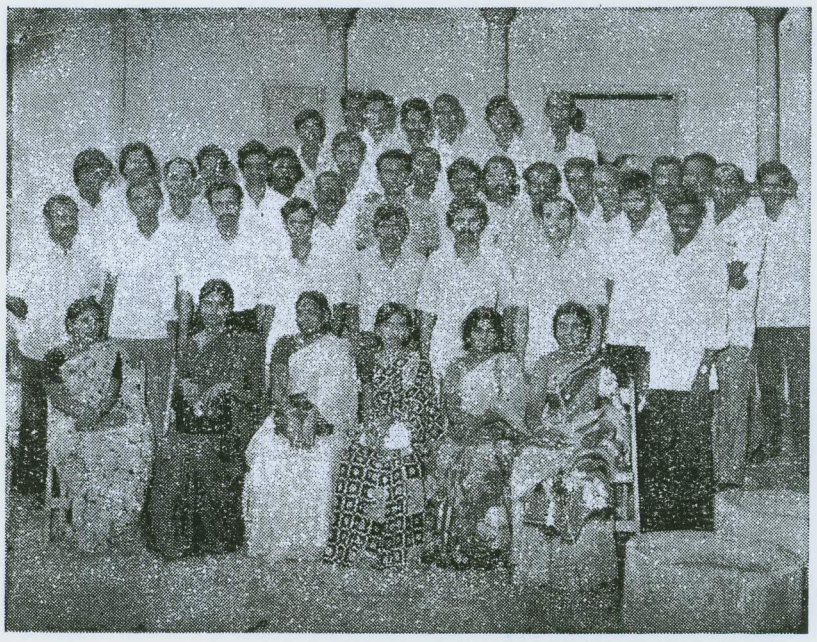
The existing methods of handling fish on trawlers led to nearly 20 per cent of spoilage, which could be eliminated by taking insulated containers to the fishing ground and transporting the catch to the shore and the interior in iced conditions.

The second part of the programme would concentrate on production of diversified products from low cost fish. These had a very low commercial value which could be enhanced by processing, from the low cost fish, a variety of nutritious products like fish wafers, soup powder, noodles etc.

Shri Kuriyan said the highlight of the programme was training in production of shark fin rays. At present, dried shark fin was an important marine item exported at a very low price. But the importing countries extracted the rays from the fin and marketed it at a much higher price. India had now developed the technology needed for the extraction.

The third course would stress the importance of quality control in fish processing.

ThiruC. Chellappan, Tamilnadu Director of Fisheries proposed a vote of thanks.



Participants and instructors of the training course.

GUIDELINES FOR THE SELECTION OF MATERIALS FOR MARINE SCREW PROPELLERS

The propeller in a fishing boat is being one of the most stressed components, the selection of materials for propeller is primarily governed by technical considerations. A propeller alloy should essentially show good strength, high corrosion resistance and superior erosion resistance. All the three factors are very important, as the propeller is operating in a highly corrosive environment namely, sea water for hours together continuously. The rotation of the propeller causes the tip region moving at a considerable speed, in turbulent water. The propeller is, therefore, subjected to the destructive types of attacks such as impingement attack, dezincification attack and cavitation damage. All these may occur simultaneously.

Impingement attack occurs when Propeller blades strike sea water contained entrapped air bubbles. The result is the formation of a large number of pits which are generally smooth and horse-shoe shape in appearance. Most of the ferrous alloys, copper and Admiralty metal (Copper 70%; Zinc 29% & Tin 1%) are susceptible to this type of attack. Though cathodic protection of hull reduces this damage, these materials are not recommended for marine propellers.

Copper-zinc alloys generally known by name brasses are subject to dezincification attack. The damage occurs as a result of (presumably) selective dissolution of very poor mechanical strength, Sea water is a very favourable medium for intensifying this type of damage. Dezincification may be in the form of plug type (pitting) or layer type. In the trade circle high tensile brass of composition copper 57%; tin 1%; Iron 1%; Manganese 1% and remainder zinc is often termed as bronze. This alloy undergoes dezincification in sea water and therefore should not be used for marine propellers. Brasses containing 15 to 37% zinc such as Admiralty brass and Aluminium brass are also subject to dezincification. Susceptibility to dezincification increases with rise of zinc content. The remedy against this is certain alloy additions, often called inhibitors. The addition of few hundredths of a per cent arsenic, antimony, phosphrous reduces dezincification susceptibility.

A propeller is also often subject to cavitation damage which is due to a conjoint action of fast liquid flow rate (mechanical) and corrosion (electrochemical). It occurs when vapour bubbles collapse (implode) on the metal surface (propeller) causing a continuous hammering action. The preassures reaching a value of the order of 60,000 lb/sq. to destroy the metal. Cavitation damage causes the removel of the metal which can be seen in the form of a number of closely spaced craters. The surface becomes very rough.

A practical remedy is difficult and involves a two prong attack: counteracting the mechanical effects and counteracting the electrochemical (corrosion) effects. The former lies in improving the design of the geometrical shape of the propeller to minimize the hydrodynamic pressure difference associated with velocity effects of fast flow of sea water past the propeller blades. This is in the realm of naval architecture and can be achieved only by an experienced designer.

The latter involves the use of more corrosion resistant

LET'S TALK IT OVER

M/s. Peejay Indo - Bulgarian Fisheries Ltd, New Delhi :

We understand that your Institute has been able to evolve the technology to prevent black spot formation in shrips during the course of freezing. Kindly advise us about this technology?

CIFT: Prevention of black spot formation or 'melanosis' (which is an enzymatic reaction) demands cutting off access to oxygen. Generally, this can be

---

alloys which resist both corrosion and erosion. The production of satisfactory propeller materials is still more an art than a science. There are many proprietory alloys which contain four or five ingredients than copper. Manganese bronze, phosphorous bronze, special gunmetal, Nickel manganese bronze etc. are used for casting propellers. Manganese bronze is a preferred material in India, the nominal composition is as follows.

	Nominal composition %							
	Cu	Al	Mn	Ni	Zn	Fe	Sn	Pb
Manganese bronze	78							
	58	1	0.5	-	35	1	0.3	0.1

Phosphour bronze is a copper base alloy containing about 8% tin and about 0.4 % Phosphorous. Gun metals are basically alloys of copper-tin-zinc. Strength and corrosion resistence of gun metals vary considerably depending upon their composition.

Aluminium bronze (aluminium content limited to about 9%), manganese nickel aluminium bronze, stainless steel and spheroidal graphite austenitic cast iron known under the trade name, Ni Resist are some of the alloys which have found commercial applicability abrod. Aluminium bronzes are well suited for marine use but its use has been restricted owing to difficulties of maintaining controlled conditions during manufacture. Manganese nickel aluminium bronze also shows good corrosion resistance and toughness but the manufacturing conditions require close tolerance of heat treatment parameters. Stainless steel (18 /8 - 18% Chromium and 8% Nickel) containing 2-3% molytedenum exhibits excellent corrosion and erosion resistance in sea water. Care is to be exercised to avoid hair-line cracks during manufacture. These alloys are also prone to crevice attack. Ni Resist represent a class of cast iron which is comparatively cheap and possess adequate mechanical strength and corrosion /erosion resistance. Ni Resist conforming toD2C - ASG3 of IS 2749 - 1964 of the following chemical composition has been found to be suitable for propeller casting.

Nickel	:	21.0 - 24.0%
Carbon	:	3% max.
Silicon	:	1.0 to 2.8%
Manganese	:	1.8 to 2.4%
Chromium	:	0.5% max.
Phosphorous	:	0.8% max.

Some foundries in India have the licence to import Ni Resist and have started production. The high elongation of the alloy permits cold working while repairing damaged propellers.

The following additional points are to be adhered to for incresieg the longetivity of propellers. The propeller is to be finished to a smooth surface so that it will not provide site for nucleation of bubbles that cause cavitation damage. No spillage of paints on propeller should occur while painting hull. Paints spillage will cause severe local pitting. Do not anchor vessels continuously for long periods where water is contaminated with sulphides or polluted.

★

ECOLOGICAL BALANCE BETWEEN LAND AND SEA

The areas bordering the coastline of the continente are subjected to a variety of environments and they also have a sizable percentage of the world's population. Industrial, residential and recreational complexes occupy large areas of the coastal tracts of the highly developed countries.

In the near future, expansion of many of the underdeveloped countries will undoubtedly be concentrated in coastal zones. With the rapid advances in technology and with increasing population, the coastal areas will assume major importance in respect of energy, minerals, transport, food and recreation.

The various environments with in the coastal zone are: bays, deltas, sandy beaches, shingle foreshores, lagoons, muddy foreshores, salt marshes

---

prevented by immediate icing after catch and keeping the meterial immersed in a mixure of ice and water. Since the enzyme responsible for the black spot formation is more concentrated in the head portion, removal of the head portion immediately after catch and washing of the tails followed by icing delays the phenomenon. Prawns that have remained for long without ice at ambient temperature, when iced, develop black shots much earlier than those iced immediately after catch. This points to the significance of icing immediately after catch. Treatment with chemicals like pottasium metabisulfite in small quantities used as dip also delays onset of 'melanosis'. A 0.2 - 0.5% solution, either in fresh water or sea water can be used with a dipping time of 1-2 minutes. It may kindly be noted that higher levels of sulfite are liable to cause bleaching of shell colour.

Deputy Director, Exploratory Fisheries Project, Port Blair :

Kindly recommend the best prescriptives for the cotton long - lines and name of the firms who can supply them.

CIFT: Cotton long lines can be treated in 5% warm cutch solution (tannin) for a night and then fixed in 1% copper sulphate solution to which liquor ammonia is added till a deep blue solution is obtained. The material is kept in the bath for 15 mts, washed thoroughly in water and dried. A further coating of tar and kerosene in the ratio of 3:1 may be done and the samples dried in shade.

A second method is to use ' tar stat ' a chemical preservative which can be obtained from M/s Shalimar Tar Products, XXX/621, warriam Road, Ernakulam, Cochin-683 016. You may contact their agents at your place.

M/s. Jeewajee & Company, Madras :

We would like to know the types of Nylon Monofilament twines and ropes acceped by your Institute for testing and the quantity of the samples to be sent.

CIFT : This Institute can undertake testing of twines and ropes of different materials of breaking strength up to 250 kg. For testing purpose, quantity as given below of the different samples may be sent.

Rope	—	2 Kg
Twine	—	½ Kg
Yarn	—	¼ Kg

★

estuaries, rocky foreshores, sand dunes, shingle formations, earth cliffs, rocky cliffs and reclaimed lands.

However because of their location near the land, coastal environments have large amount of nutrients. The nutrient supply, from the land sources combined with the generally shallow water levels is responsible for the diversity and the magnitude of the faunal and floral populations.

Sediments of these areas contain large amounts of water often charged with various salts. Gas also occurs in large quantities in various reservoir sands of beach and barrier islands and inner shelf sands.

Ancient deltaic sediments act as valuable source beds and reservoirs for a large fraction of the known petroleum resources and coal. Estuarine and salt marshes serve as valuable source of sea food and nursing grounds for several oceanic organisms of economic importance.

India has a coastline of 5,680 km. and an area of 3,86,000 sq. km. off-shore areas where the water depth is within 200 meters.

Legally, the land abutting the sea is under the jurisdiction of the State Governments whereas, the waters upto a distance 12 km from the land are the territorial waters. India also has the right of a 100 km area for exclusive fishing.

Further with the adoption of the idea of 200 nautical miles Exclusive Economic Zone (EEZ) by the Maritime Zone Act of January 15, 1977, India gets the exclusive right for exploring and exploiting the living and non-living resources within this area.

India has extensive areas of sedimentation in the West Indian Ocean which are considered to be potentially rich oil sources.

The oil and Natural Gas Commission has carried out surveys in the Gulf of Cambay, Gulf of Kutch, Coromandal Coast, the Krishna and the Godavari deltas and the Sundarbans and have discovered eighteen structural features which are considered to be geologically favourable for oil exploration.

India's first off-shore oil exploration was at Aliabett off Combay. Bombay High is located about 12 kms north of Bombay.

Explorations are also in progress in other areas, nearer the shore, namely the Cauvery, the Godavari and the Hooghly river basins. It is possible, that all the other river mouths and wide areas of continental shelf will soon be covered for oil exploration.

A potential oil well must have, on the shore, a large complex of supporting ancillary facilities. The pipes to carry crude to the on-shore facilities will have to be laid and the spill containment system developed.

The impact of all these will naturally be felt on the coastal zone and the general ecological niches and spawning areas of fishes and other organisms are bound to be seriously affected.

The extraction of mineral resources of the sea bed is at present receiving serious attention of the Government of India even though no major deposit has yet been reported as a result of the preliminary surveys. When mining of the sea bed is started, its impact on the coast, even though unpredictable, will naturally be tremendous.

The setting up of nuclear and thermal plants near the coast is another source of coastal environmental hazard. The Kalpakkam nuclear energy plant situated south of Madras is fast nearing completion.

The immediate effect of nuclear plants will be on the water environment, by creating thermal pollution. Apart from it, the larges intake of water for cooling the towers will trap large masses of planktomic organisms leading to their

total extermination. The fear of radioactive contamination is another danger.

Our marine fishery is fast expanding and soon our expertse is bound to reach a stage of exploiting the living resources in the 200 mile Exclusive Eronomic Zone. This vast expansion of our fishery will naturally necessitate the development of on-shore facilities for processing in a big way, thereby creating congestion and possible rivalry with other industries such as shipping and the oil industry.

Another industry where the interests will clash with oil and shipping industries is coastal aquaculture. The expanding demand and high prices of prawns prevailing in the foreign markets to-day have already prompted industrialists to start fish farms along the coastal zone especially near the estuaries, creeks and lagoons.

To relieve congestion at ports like Bombay, Cochin and Madras. we will soon have to establish deep water ports to handle container cargo and other large tonnage ships. This would envisage an increase in small craft traffic, on-shore supply facilities and housing and other coplexes for personnel

At present, there is limited dumping in our off-shore waters. Dumping is the disposal of any type of waste including nuclear waste in the coastal waters.

India will have to seriously consider the problem of waste disposal and control the disposal of domestic waste into the sea and maintain strict security measures against international dumping in our waters.

Practically no consideration has so far been given to the problem of conservation of marine envronments of our coastline. There is an urgent need for the establishment of suitable areas for scientific research. recreation and tourism development.

Sand dunes, coral reefs, estuaries, mangroves, sea grass beds beaches and other such coastal habitats play a very important role not only in keeping the ecological balance of the land and the adjacent sea but in preventing large-scale erosion of the coastline.

It is therefore essential that representative areas of the ecosystems are protected through the esrablishment of marine parks and reserves.

Investigations mainly of a geological and engineering nature are to be intensified along the Indian coast to locate the oil and mineral resources. The extraction of oil and minerals should then be regulated through proper legislation.

This envisages a thorough environmental impact study on the part of the industry, and an act requiring precautionary/ preventive/safety measures may be formulated by the government to enable it to issue the necessary permits.

With regard to the management of marine parks and reserves of renewable resources regional management fishery councils will have to be set up rather than individual state councils.

It will be bettr if the coastal States take the over-all interests of the nation into account while considering comprehensive plans to tackle the problems of management and development of the 200 mile Exclusive Economic Zone.

The coastal zone management programme is of crucial importance. A system of zoning in which a certain area is set aside for a particular major use and other areas are given over to multiple uses should be adoped.

Strict maintenance of some stretches of the coastline in a natural or semi-natural state, exclusively for conservatian of habitats, should also receive careful attention.

Categorisation of activities should be evolved in such a way as to avoid conflicting uses of the coastal zone.

A national policy on coastal zone management should be formulated by a multi-disciplinary team. The same team can be constituted into a coastal management task force to formulate a policy to preserve, or restore the coastal zone effectively.

Source: Hindu.

"GLEANINGS FROM OTHER JOURNALS"

Fishing with the "Humboldt"

The South American republic of Peru used to be one of the earth's major fishing nations but is currently hard hit by the disappearance of the shoals from its pacific coast: there are now plans however for it to make its catches worthwhile again within a few years. This is the aim of a German-Peruvian project involving the construction and operation of a research vessel. the "Humboldt", fully equipped with laboratories and surveying facilities. The 76 meter craft is to conduct a complete investigation of Peru's coastal waters. The "Humboldt" is scheduled to make its maiden voyage this summer. Over all responsibility for the project lies with the Maritime Institute of Peru (Imarpe) in the port of Callao. Bonn has provided a total of DM 20 million for the project.

— SCALA

Govt. Clears Integrated Fisheries Project

Dr. M. S. Swaminathan, Union Agriculture Secretary, has announced that the Central Government had given its clearance to an integrated five-state project for fresh water inland fisheries dovelopment for which a loan was being sought from the World Bank.

Disclosing this at a press conference in Cochin Dr. Swaminathan said that this integrated project which was estimated to cost Rs. 75 crores was being taken up during the Sixth Plan in West Bengal, Orissa, Bihar, Madhya Pradesh and Utter Predesh for increasing fish production in the country.

— HINDU

Work on Neendakara Fishery Harbour soon

Work on the fishery harbour at Neendakara is to commence, according to an official announcement, in the month of November. A sum of Rs. 2.5 crores has been sanctioned for the purpose.

— HINDU

Rise in Marine Fish Output

Marine fish production in India rose to 1.40 million tonnes in 1978 from 1.26 tonnes in the previous year, registering an increase of 11 percent according to Central Marine Fisheries Research Institute sources

Kerala, with a landing of 3,73,000 tonnes topped the list of Indian maritime states, followed by Maharashtra (2,84,000 tonnes), Tamil Nadu 2, 13 000 tonnes, Gujarat (2. 02, 000) tonnes and Karnataka (1,53, 000 tonnes).

Other maritime States landed less than 1, 00, 000 lakh tonnes. All States, except Andhra Pradesh, registered an increase in their total annual landings during the year.

The major components of the landings were: oil sardines panaeid prawns, Bombay duck, scianenids and mackerel.

— HINDU

★

CIFT TESTS MARINE ENGINES

The Central Institute of Fisheries Technology have done considerable amount of work in recommending a good number of engines suited to different sizes and types of fishing vessels. Marine engines manufactured in the country have been tested both in the test bed and under field conditions and drawings for proper installation of these engines and coolng arrangement inside the engine room have been prepared and passed on to the engine manufacturers.

The Indian Standard institution has authorised the CIFT to conduct the testing of the engines used for fishing vessels (vide I. S. 8013. 1976) and the Institute renders technical help in this direction. On request from the manufactures, the concerned engineers from the Institute are deputed to conduct lhe test at the test bed in the

Two More Danish Vessels for Fishery Training

Denmark has made available to India two modern fishery training vessels including expertise and equipment under an agreement on technical cooperation between the two countries.

The vessels christened "Skipper two" and "Skipper three" which are both identical, are meant for imparting training in deep-sea fishing.

— HINDU

A Six-point Strategy for Fuel Conservation

The Perkins Engineering Group has proposed a six-point strategy for the conservation of the world's fuel oil resources which it urges government and official bodies worldwide to adopt.

The proposals are:

Existing petroleum-based fuels be conserved by ensuring that their use is confined to automotive applications.

All stationery equipment be powered by traditional forms of energy such as electricity, gas and coal or by newer developments such as solar energy.

The use of the compression ignition engine and its derivatives be extended using not only petroleum-based fuels but also possible alternatives such as liquid fuels from coal and alcohol fuels.

That the production of wide-cut fuels, obtaineid by eliminating certain selective refining processes, and suitable for use in diesel enginess, be encouraged, thus conserving energy currently wasted by refinery cracking processes.

That the diesel be adapted to make the most efficient use of distillate fuels derived from coal and alcohol fuels when sufficient quantities are available.

That alchol fuels are initially utilised for blending with gasolene in progressively increasing quantities, thus maximising the proportion of the oil barrel available for diesel and wide cut fuels.

Perkins points out that the diesel is the most efficient and economical way of using available petroleum-based fuels and that the greater amount of basic energy consumed in the process of refining gasolene is itself wasteful.

The internal combustion engine of the future as perkins sees it, will be a development of the reciprocating piston engine-much as we know it today - but would probably feature additional combustion assistance.

— HINDU

Meet Our Scientists—9

Dr. K. GOPAKUMAR

Dr. K. Gopakumar is a Scientist - S2 of the Processing Division of CIFT, Cochin. Born on 14th April 1942 at Muvattupuzha, Ernakulam District, Kerala State. He matriculated from Government High School Muvattupuzha in first class. Later joined Nirmala College and passed B. Sc in Chemistry in First Class in 1962 and joined University College and took Masters degree in Pure Chemistry in First Class in the year 1964 from the University of Kerala. He was awarded the K. R. Krishna Iyer Gold Medal by the University of Kerala in 1964 for having scored the First Rank in Chemistry. In 1973 he took Ph.D degree in Biochemistry from the University of Kerala under the guidance of Dr. A. N. Bose, former Director of CIFT, Cochin.

After working for few months as a lecturer in Chemistry in Nirmala College, Muvatupuzha. he joined CIFT in 1964 in the Biochemistry section. He was promoted as Assistant Research Officer in November 1967. He took charge of the post of technologist and Project Leader of ICAR Co-ordinated Project on Utilization of Trash Fish in February 1972 and continued to work in the

---

factory premises.

The tests are carried out as per IS; 1601 - 1970 which is twelve hours continuous full load test during which the following parametres have to be observed.

1) Temperature measurements, both inlet and outlet of cooling water (for water cooled engines) and air (for air cooled engines) 2) Temperatures of of Lubrication oil exhaust gas, atmosphere etc. 3) Lubrication oil pressure 4) RPM of the engine 5) Fuel consumption 6) Relative humidity 7) Lubrication oil consumption for 12 hrs running.

For conducting the above tests the following facilities and instruments are required. Facilitis for testing the engines for studying the performance of the engine in the test bed for continous running for 12 hrs at full rated load at rated rpm.

Instruments such as 1) Thermometer to measure engine exhaust temperature and atmospheric temperature (2) Techo meter to measure engine shed (3) Instruments to measure relative humidity of test site (4) Instrument to measure atmospheric pressure of test site (5) Instrument to measure oil temperature and pressure and arrangements to measure fuel consumption.

The above mentioned type testing is only a part of the test. The actual performance of the engine is assessed only after field trials by installing the engine on board a fishing vessel for fishing - cum-endurance tests.

■

What they have to say about CIFT

I have been very happy to return to CIFT and have the opportunity to see in some detail the very varied and impressive work that is being carried out.

Shri T. A. GULLARD,
Dept. of Fisheries,
FAO, Rome

One of the best in the Country. The atmosphere, cleanliness, discipline and its research impressed me verymuch, the credit of which goes to the Director and his team of Scientists

Shri SUJAN SINGH, M. P.

I was happy to go round the Institute and was much impressed with the work being done here.

Shri VAIDYANATHAN
Joint Secretary,
Govt. of India

★

---

same capacity until March 1979 when the project was finally closed. Subsequently Dr. Gopakumar was transferred to the Processing Division and is working in the project on diversified fish products.

Over the years Dr. Gopakumar has served in the fields of fishsry Bio-chemistry, Fish Processing, Fish Transportation and its Utilization. While he was in the Biochemistry section he made significant contribution in the field of lipid technology particularly in marine lipids and then changes in processing and chilled storage. As the project leader of the project on Utilization of Trash Fish he was chiefly responsible for the development of speciality products like fish wafers, fish soup powder, fish hydrolysates, pet foods etc. Some of them are now being manufactured and marketed by small scale industrialists. He has published over thirty scientific and technical papers, in leading national and international journals in food science.

In 1973 he was made a fellow of the Oil Technologists Association of India. In 1973 Dr. Gopakumar was elected a fellow of the Institution of Chemists India for his significant contribution in marine oils.

Dr. Gopaknmar has served as a member of several doctoral committees in the Universities of Cochin and Kerala. He has adjudicated M. Sc., M. F. Sc. and Ph. D theses from several Universities. Dr. Gopakumar is an approved guide for Ph. D degrre in Chemistry, Bio-chemistry, Food Technology and Marine Sciences in the Universities of Kerala, Jadavpur and Cochin and a number of students are at present working under him in the above Universities.

Registered with the Registrar of Newspapers of India Under No. 28 (AL) /3/ 78 - NT

CIFT is at your Service

It transfers Fishery Technology by way of:

- Demonstrations of Fishing and Fish Processing techniques evolved by it
- Answering Technical queries
- Supplying project reports and design drawings
- Training courses on fishing and fish processing

Please contact

Director,
C. I. F. T.,
Matsyapuri P. O.,
Cochin - 682029.

Edited and published by K. C. Purushothaman, Editor-Cum-Information Officer, for the Director Central Institute of Fisheries Technology, Matsyapuri P. O., Cochin - 682 029 and Printed by him at Genuine Printers & Publishers Cochin - 682 016 Kerala.,