

THE TIDAL WORK OF NORGES SJOKARTVERK

Lecture delivered during the VIth International Hydrographic Conference,
Monaco, April-May 1952, by Seksjonssjef E. SUNDBY.

Mr. President, Delegates,

I hope you will all forgive me for drawing on your precious time by a short lecture on the tidal service of the Norwegian Hydrographic Office.

It is certainly not my intention to expatiate on tidal problems in general nor to disclose any new discoveries on the tides. I would merely like to say just a few words on the matter : How a small hydrographic office starting from scratch and poor economic resources was able to build up a — to our intention — reasonably effective tidal service.

Up to 1932, — the year of segregation of the Hydrographic Office of Norway from the Geographical Survey — no special agency had executed a systematic planned tidal service in Norway with the intention of predicting the tide. The Geographical Survey of Norway and the State's port authorities, though, had been running for some years a few automatic tide gauges on the coast in order to compute the mean water level, and a special board, called the Norwegian Geodetic Commission had long ago calculated the harmonic constants for a few ports by the method of Darwin. The tide on the southern coast of Norway is very small (Z_0 in Oslo = 28 cm.), and off the southwestern coast we have an amphidromic region. But the tidal amplitude rises from Stavanger on to Narvik and to the Russian border, where we have a maximum range of three and a half meters.

Shortly after the segregation just mentioned the Norwegian Hydrographic Office in 1936 worked out a detailed programme of how to tackle the question of tidal investigations resulting in the publication of tide tables for the coast of Norway comprising 10 standard ports and about 165 secondary ports.

The work started the following year, in 1937. Two automatic tide gauges had been bought from U.S. and these two, together with an old one, were placed on the northern and western coasts in the ports of Tromsø, Rørvik and Florø. In addition forty tide staffs were mounted in smaller harbours in the northernmost part of the country between Harstad and Kirkenes. These staffs were read thirteen hours daily for a period of thirty days by the most reliable men to be found at each port.

Shortly after the end of the thirty-day period the non-harmonic constants were calculated in the Hydrographic Office, and the first rather meagre edition of the « Tide Tables » of Norway for the year of 1938 was prepared and published.

This edition contained three standard ports, namely Vardö, Bodö and Bergen, the predictions of which were made by the Naval Observatory of Wilhelmshafen in Germany by means of the earlier mentioned harmonic constants, calcula-

ted a long time since by the Norwegian Geodetic Commission. Furthermore the non-harmonic constants for the forty secondary ports which were calculated the same year, were also given in this first edition.

As our Hydrographic Office had only two modern automatic tide gauges, the other Norwegian institutions which had such gauges in operation were invited to co-operate in tide-observations to obtain sufficient data for calculating harmonic constants for the ports desired.

At the beginning the young Hydrographic Office of Norway of course had no staff especially instructed and trained in tidal work. So therefore in 1938, we had the new harmonic constants for four ports calculated by the Norwegian Geographic Survey, by the Naval Observatory at Wilhelmshafen and by the Liverpool Observatory and Tidal Institute, respectively.

During the summer of 1938 a surveying vessel again was detached for the next third of the planned tidal work which consisted of the mounting of sixty-six tide staffs on the northwestern coast (between Harstad and Molde). These staffs were all read every hour, between seven a.m. and nine p.m., during thirty days. The non-harmonic constants were then calculated for these ports and incorporated in the tide tables for 1939, thus increasing the number of standard ports of the publication by two (namely Vardö and Mandal) to 5 in all and the secondary ports to 108. The predictions for 1939 were again made by the Naval Observatory at Wilhelmshafen.

In 1939 the last third of the preparatory work in order to give the tide tables its planned and final form was done. During the summer of 1939 sixty tide staffs were mounted on the western and southern coast between Molde and the Swedish frontier. The non-harmonic constants were calculated, and the harmonic constants for five more ports were computed, this time by the Naval Observatory of Wilhelmshafen, the Norwegian Geographic Survey respectively, and for the first time one port was analyzed by the Norwegian Hydrographic Office.

The Hydrographic Office now had in hand all the necessary material required for the future predictions of tides for 9 standard ports, viz. Vardö, Hammerfest, Tromsö, Narvik, Bodö, Rörvik, Kristiansund, Bergen and Mandal with 165 secondary ports. But unfortunately our staff of tidal experts still was insufficient, and we had to rely on outside help. Thus the predictions for 1940 were again computed by the Naval Observatory of Wilhelmshafen.

As we were now very anxious to become independent at the earliest convenient time we ordered in 1939 the construction of a tide predictor with 30 components from Kelvin, Bottomley and Baird in Glasgow.

In this same connection we approached the world famous tidal authority, Dr. A.T. Doodson of the Liverpool Observatory and Tidal Institute. On that special occasion as well as during many years to follow, we have greatly profited by his extremely valuable and kind help. Dr. Doodson was the adviser and the supervisor of the Norwegian Hydrographic Office in the matter of ordering and constructing the tide predicting machine. He also admitted to his Tidal Institute and for 1 1/2 year trained one of our hydrographic surveyors. This Norwegian apprentice in tidal works arrived at Dr. Doodson's one month before the outbreak of the war, so consequently we didn't see him again till 5 years later, — nor did we ever see the tide predicting machine from the firm of Kelvin, Bottomley and Baird.

In the meantime our predictions for 1941 had been made by our friends in the U.S. Coast and Geodetic Survey shortly before the occupation of Norway. They were kept secret and were never published. The occupation forces, however, computed themselves the tide tables for that year at the Naval Observatory of Wilhelmshafen and ordered the printing of them. For the successive years of the occupation no Norwegian tide tables were published, and the Norwegian tidal observations on the coast were almost completely abandoned in this period.

Several of the Norwegian automatic tide gauges were destroyed or damaged during the war, but the occupants successively mounted 14 tide gauges along the whole coast. These machines were made by the firm Ott, Kempton, and were of an excellent construction. After the war they were all handed over to the Hydrographic Office by the Norwegian and allied authorities. We had now enough modern machines to satisfy all reasonable demands along the whole coast of our country.

Shortly after the war we again took up the work of publishing the tide tables. But, as the tide predictor ordered in 1939 in Glasgow had been cancelled by the British firm owing to the war, we again had to go abroad to have our tides for 1946 predicted. Once more it was the U.S.C. and G.S. who kindly assisted us in this matter.

But as soon as the bells of freedom again were ringing in Norway we hastened to contact our friend Dr. Doodson to ask his assistance in ordering another tide predictor, and thus by his intervention we ordered a machine from the firm Chadburn Ltd., Liverpool. This machine of thirty components was received and installed in Oslo in the fall of 1947. While we were awaiting this tide predictor, the U.S.C. and G.S. was again so amiable as to compute our tide tables for 1947 and so did the Hydrographic Department, Admiralty, London, for the year 1948. From that time on, however, the Norwegian Hydrographic Office self has been dependent in predicting the tides of our coast. The tide tables for 1949 and the following years have been computed by ourselves. From that time on we have by agreement also been delivering the predictions for the ports of Bergen and Narvik for U.S.C. and G.S. and for the Hydrographic Department, Admiralty, London.

I am glad to be able on the behalf of the Norwegian Hydrographic Office to express our very best thanks to all fellow-institutions who have always been ready to assist us in such an amiable and valuable way, and we are now ourselves happy to assist the said institutions in delivering the predictions for the Norwegian ports which are included in the world-wide tide tables of these institutions. It is — we believe — such international co-operation and good-will that give us bright spots in a troubled world.

And last but not least I wish to give special thanks to Dr. Doodson who has, not only by his institution, the Liverpool Observatory and Tidal Institute, but also quite personally spared his time to see to our problems.
