CHAPTER 20

QUANTITATIVE TRACING OF LITTORAL DRIFT

Dr. Per Bruun

Professor of Harbour Engineering, Technical University of Norway, Trondheim NORWAY.

ABSTRACT

Tests were run at Fernandina Beach, Florida, using fluorescent tracers and bed load traps with automatic doors and hydraulic lift to determine the thickness of the bed load transport layer on the bottom ("bottom creep") (ref.1). Four special bed load traps with hydraulic remote controlled doors were installed on an ab. 800 ft. long pier. Fig. 1. Tracers of various colours were dumped at various distances from the pier. Two types of bottom profiles, Fig. 2, "berm profile" and Fig. 3, "bar-profile" were tested. As an example Fig. 4 shows test arrangement and wave action for test No. 17 (berm profile). Longshore wave power for this particular test was 1,5 Watts per ft of wave (one Watt is ab. 0,1 kg m/sec or ab. 0,0014 Horse Power), $H_{1/3}$ was 0,45 m, $T_{1/3}$ was 4-5 sec.

Fig. 4 shows average velocities of grains up to the point of maximum concentration as well as average velocities during the test of 1,3 to 1,5 hours (in paranthesis). Thickness of the moving bed load sheet layer based on the average velocities found during the testing period (ref.1) and the migrating quantities per meter of bottom were as indicated in Table 1.

Table 1. Sheet layer thickness, ave. grain velocity and quantities per meter per hour. Longshore wave power ab. 1,5 Watts)ft or ab. 5 Watts/meter.

	Station 2	Station 3
Layer thickness in cm	0,00064	0,00073
Number of grains of 0,2 mm	1/35	1/30
Average velocity of grains meters/min.	1,3	0,95
Quantity in liters per hour/m	0,48	0,42
Quantity in kilograms per hour/m	0,28	0,25

It is interesting to note from this and other tests that quantities of drift seemed to be related to the longshore wave energy. Fig. 5 shows longshore drift per ft as function of longshore wave energy per ft for a number of tests which include berm as well as bar profiles and wave energy input ranging from a few Watts to ab. 50 Watts per ft of wave crest. Tidal currents could not be eliminated. Results seem to bear some witness hereof. From Fig:5 it may be seen that:

a) Longshore transport as bed load seems to increase with longshore wave energy. Not enough results are available however to draw any conclusions, and it should be noted that all results refer to bed-load in narrow areas only. Most littoral drift formulas assumes a linear relationship between longshore drift and longshore wave energy.

b) The importance of a longshore (tidal) current superimposed on the wave-energy current may be noted for the lowenergy section.

c) The importance of the longshore incl. tidal currents combined with the stir-up may be seen from the results for the higher energy levels. The perpendicular-to-shore component of the wave energy 1s twice as high for the 44 Watt/ft longshore wave energy case as for the 32 Watt/ft.

d) The importance of the longshore current is also evident from the trough transports predominance over bar transport for the energy levels under consideration. This is undoubtedly going to change for higher inputs of wave energy accompanied by frequent wave breaking and stir-up activity on the bar.

e) The results mentioned above are of preliminary and indicative nature only. Larger equipment and continuous recording is necessary in order to draw conclusions of more general value. Such test should if possible be carried out on a shore without longshore tidal currents. Two piers a few thousand feet apart on a straight shore would be a great advantage for the tracer tests and for comparison between quantities.

Other results from this testing program are mentioned in paper by E. Thornton at this conference.

Bruun, P. and J. Purpura (1964): "Quantitative Research on Littoral Drift in Field and Laboratory", Proc. IXth Conference on Coastal Engineering, Lisbon, Portugal, pp. 267-288.

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NO 14 (bar) TEST FIGURE 3 BOTTOM PROFILE FOR

FERNANDINA BEACH, FLORIDA



FIGURE 4 TRACER INJECTION PLAN, TEST NO 17 (berm)

