

III. YIELD CALCULATIONS

The data reported by Beacon, consisted of Neutralization Numbers and Saponification Numbers of the oil and water products together with Hydroxyl Numbers for the oil products and the percentages boiling below 203°F and 208°F for the water product.

In calculating the yields of oxygenated compounds it was necessary to make several assumptions in order to translate these results into yield data. It was first assumed that all acids were acetic and that all esters were ethyl acetate. Although specific data cannot be cited, it is understood that appreciable quantities of formic acid and formic derivatives have not been

found in synthesis products and that these products are largely acetic. There are, however, some quantities of propionic and butyric acids and it is therefore thought that the values calculated on the assumption of acetic are lower than the true values for acids and esters.

The alcohols were assumed to have the composition shown in the memorandum of September 23, 1946 on "A Process for the Recovery of Oxygenated Compounds from Hycosynthesis Products" as follows:

	<u>Weight %</u>
CH ₃ OH	12.52
C ₂ H ₅ OH	46.35
C ₃ H ₇ OH	14.51
C ₄ H ₉ OH	6.63
C ₅ H ₁₁ OH	6.63
C ₈ H ₁₇ OH	13.36

This composition was based on analyses of the Olean product and may not apply to Run 15, but is the only distribution data available.

It was further assumed that 90% of the material boiling below 203°F was alcohol of the above composition.

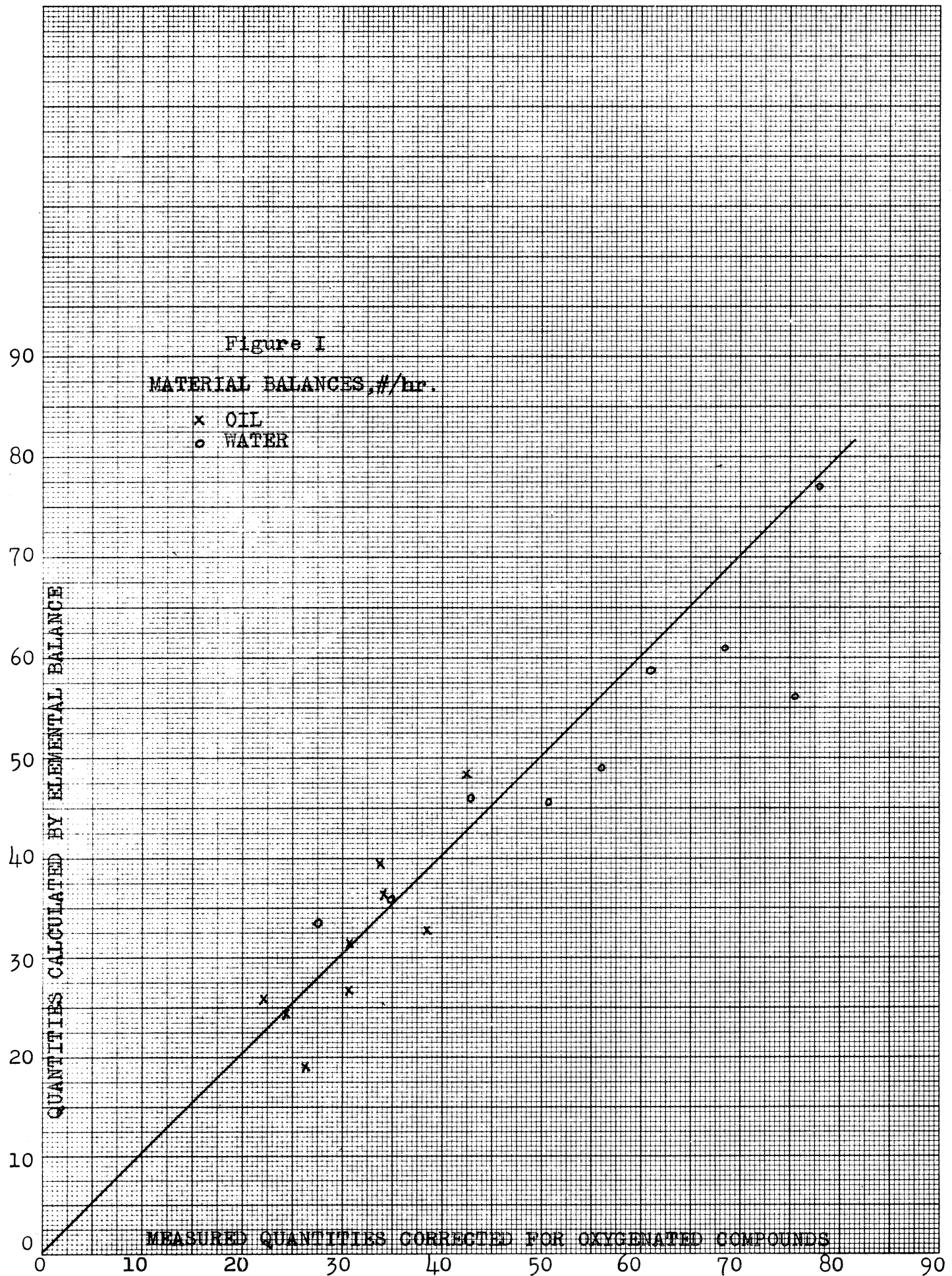
With these assumptions, the concentrations of the various products were calculated as follows:

Neutralization Number, mg. KOH per gram of sample, times 60/56.1 times 1/10, or Neut. No. x 0.107 equals Wt.% Acetic Acid.

Saponification Number, mg. KOH per gram of sample, times 88.1/56.1 times 1/10, or Sap. No. x 0.157 equals Wt.% Ethyl Acetate.

Hydroxyl Number, mg. KOH per gram of sample, times 62.15/56.1 times 1/10, or Hyd. No. x 0.111 equals Wt.% Alcohols.

From the concentrations of the various constituents calculated in this manner, and the measured quantities of oil and water phases produced, the production rates of the various products

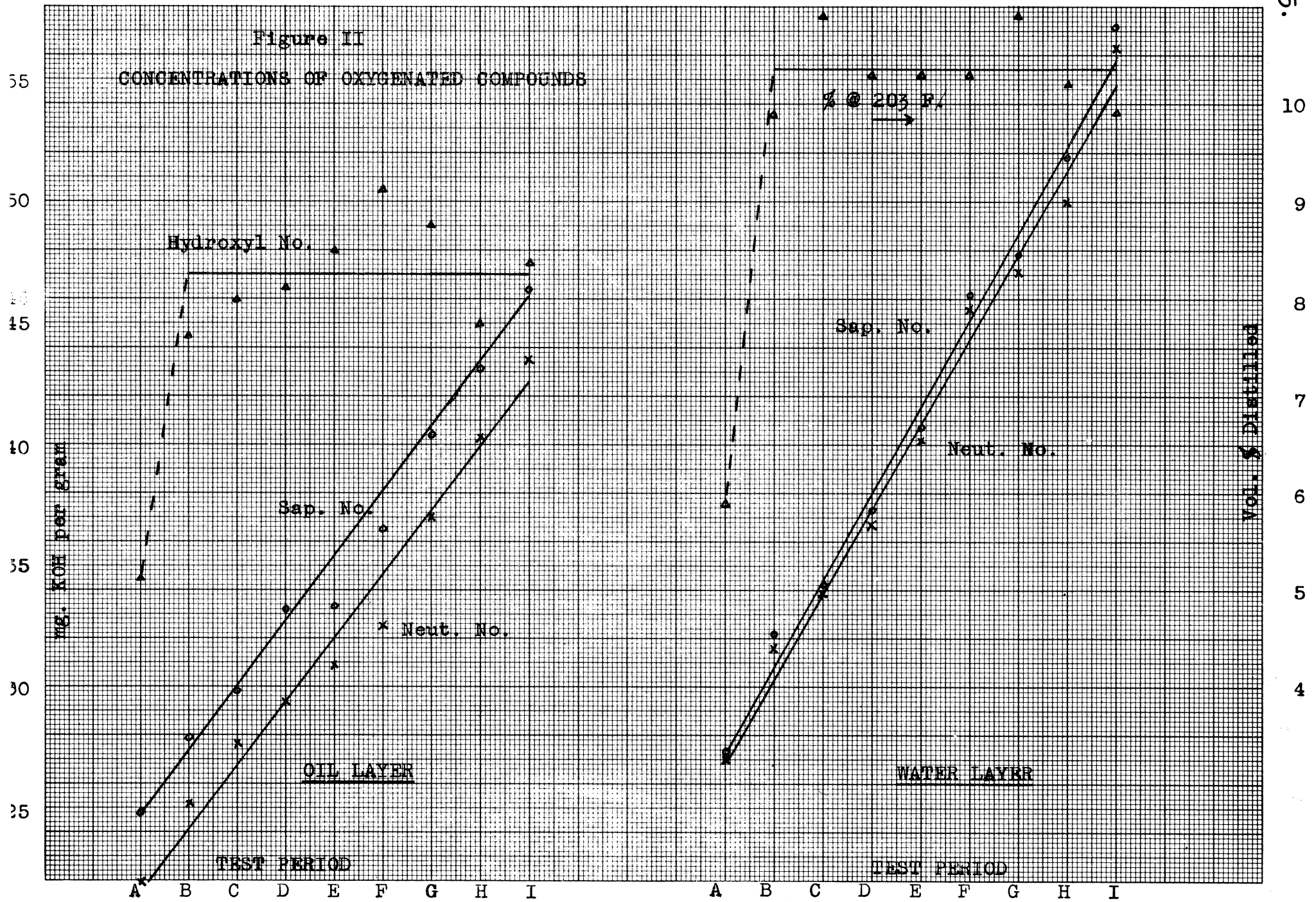


were calculated, and the yields in terms of lbs/M Cu. Ft. of hydrogen plus carbon monoxide determined.

Since the primary yield calculations are based on a carbon balance for total hydrocarbon and a hydrogen or oxygen balance for total water, it was of interest to split the yields of oxygenated compounds into hydrocarbon and water fractions and check the primary yield calculations. For this purpose it was assumed that the alcohols were 66% hydrocarbon, the ethyl acetate 54% hydrocarbon, and the acid 44% hydrocarbon. The latter two figures are, of course, ambiguous in that these compounds will require additional hydrogen, but the error is not serious for the present purpose. Calculations made in this manner are given in Table II and a comparison of the yields determined by carbon and hydrogen balance with the yields determined by distributing the oxygenated compounds in the measured quantities of hydrocarbon and water is shown in Figure I. Although there is some tendency for the yields of water determined by hydrogen or oxygen balance to be lower than the values calculated from the measured water yield, the difference is not large and the results are considered satisfactory.

Figure II

CONCENTRATIONS OF OXYGENATED COMPOUNDS



5.
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9
8
7
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