Figure 1

Effect of Column Diameter on Gas Holdup

(Tetralin/Nitrogen; 5- and 12-in. Columns)

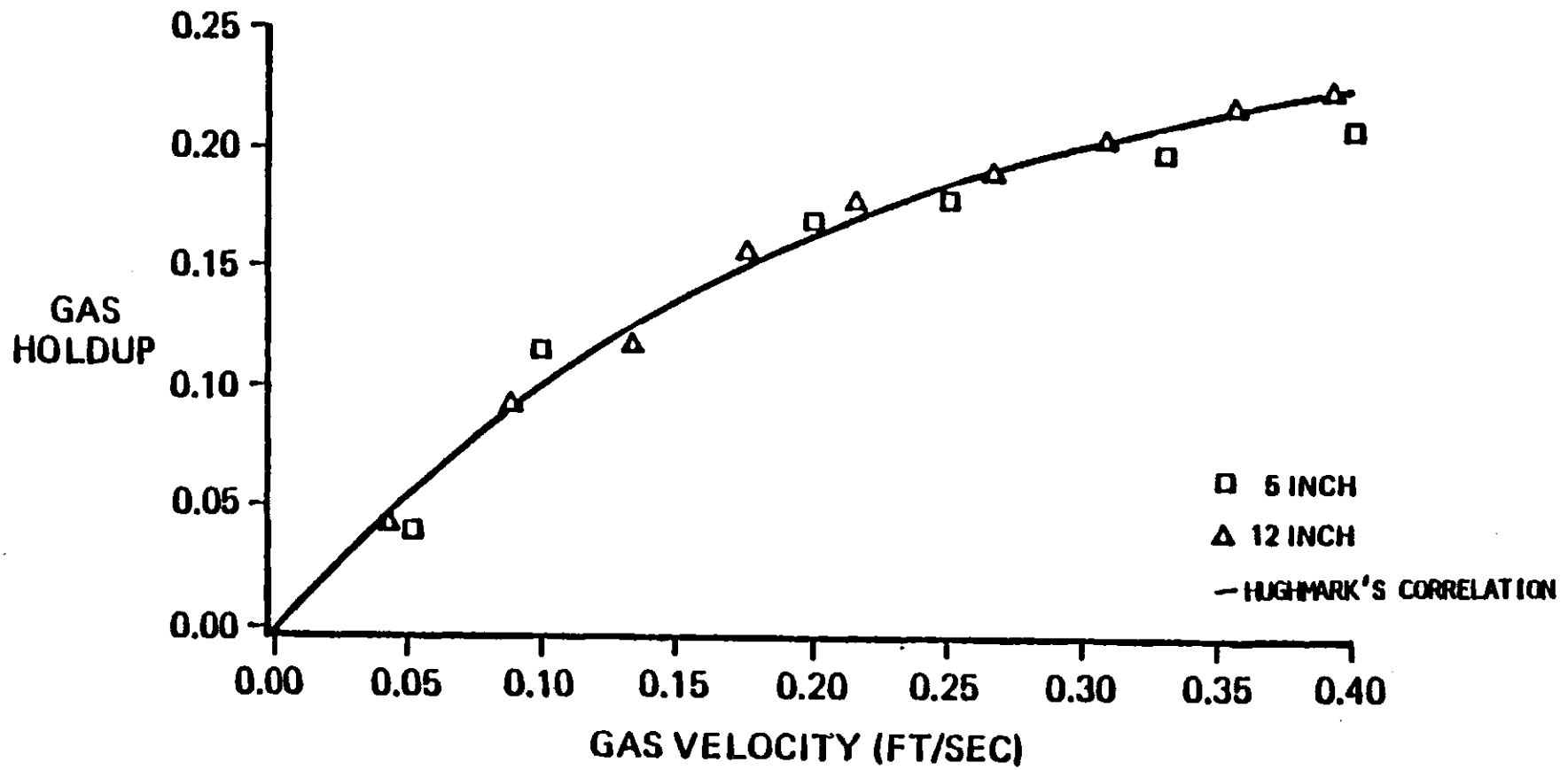


Figure 2

Effect of Column Diameter on Gas Holdup

(Water/Air; 12-in. and 6-ft Columns)

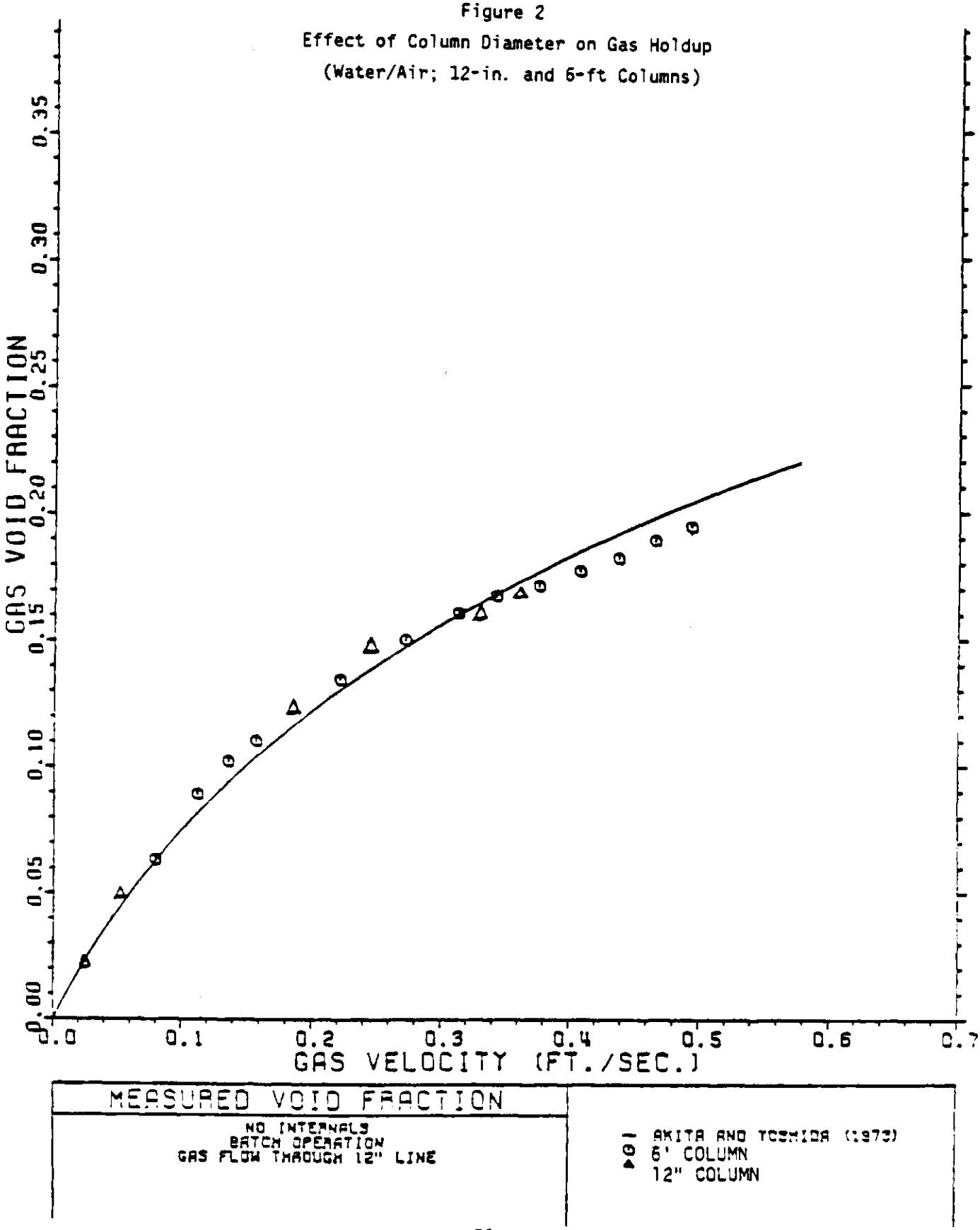


Figure 3
Effect of Column Diameter on Gas Holdup
(Air/Glycol; 5- and 12-in. Columns)

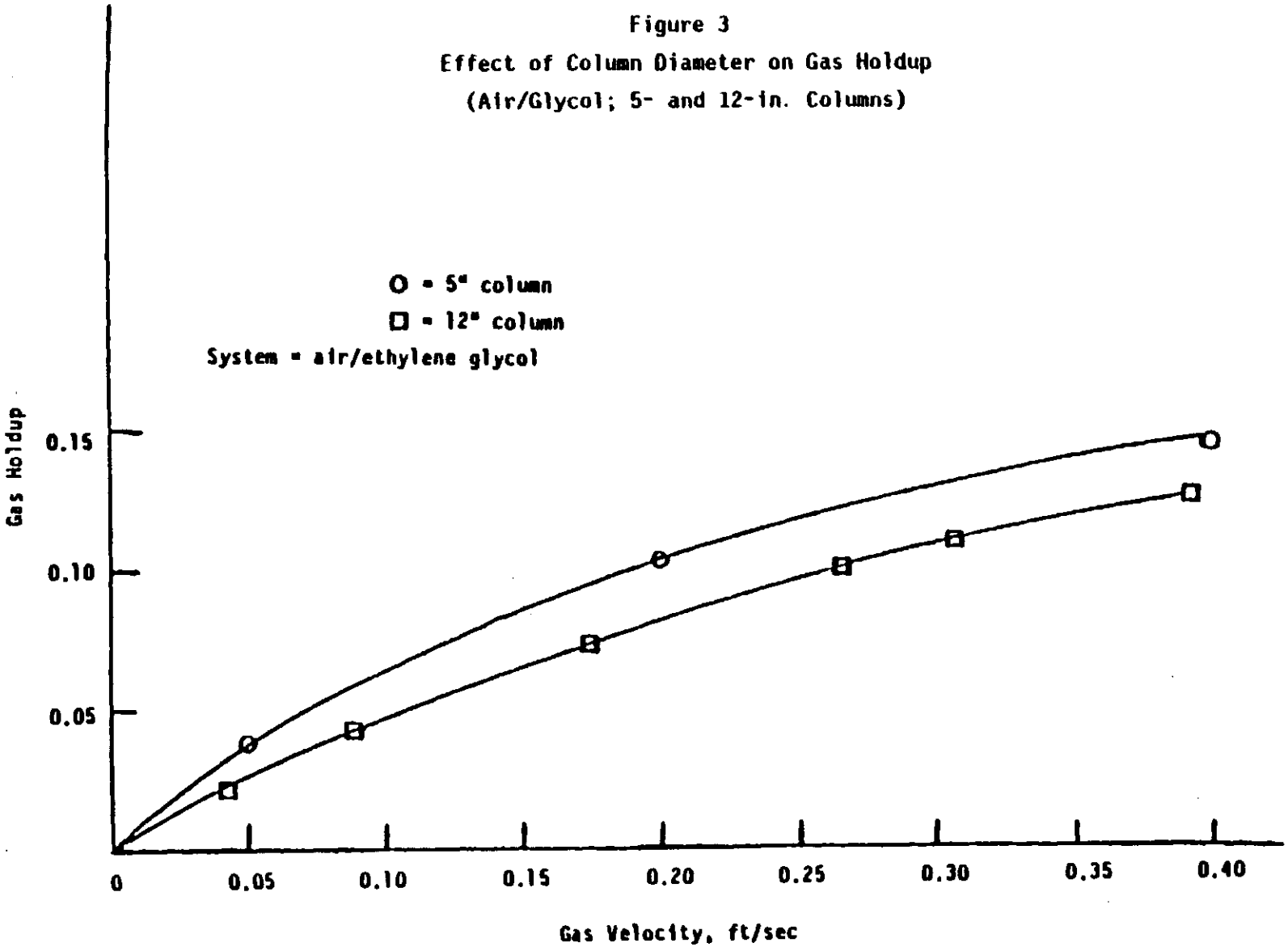


Figure 4

Effect of Liquid Velocity on Gas Holdup

(Air/Water; 12-in. Column)

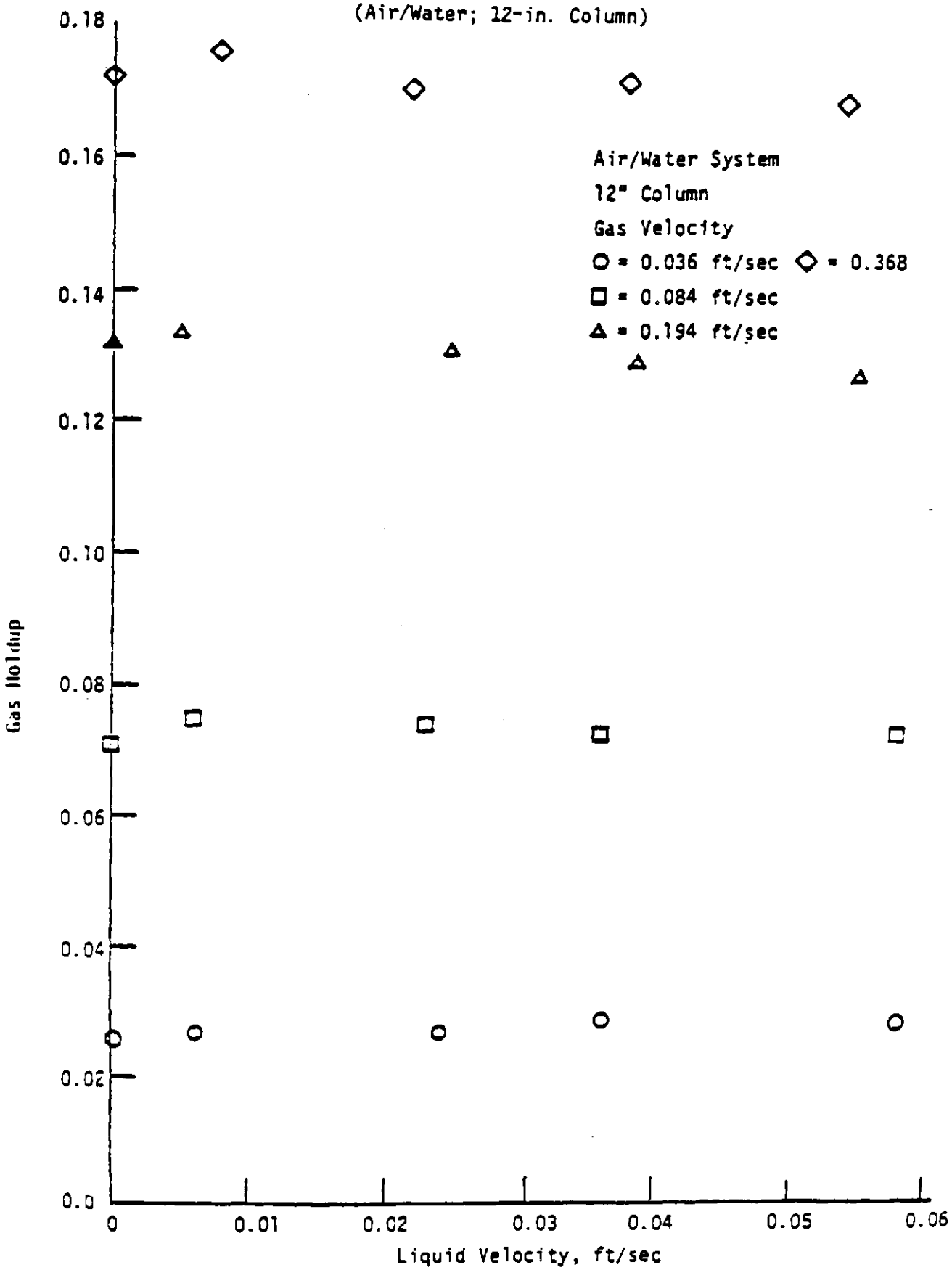


Figure 5

Effect of Liquid Velocity on Gas Holdup

(Tetralin/Nitrogen; 12-in. Column)

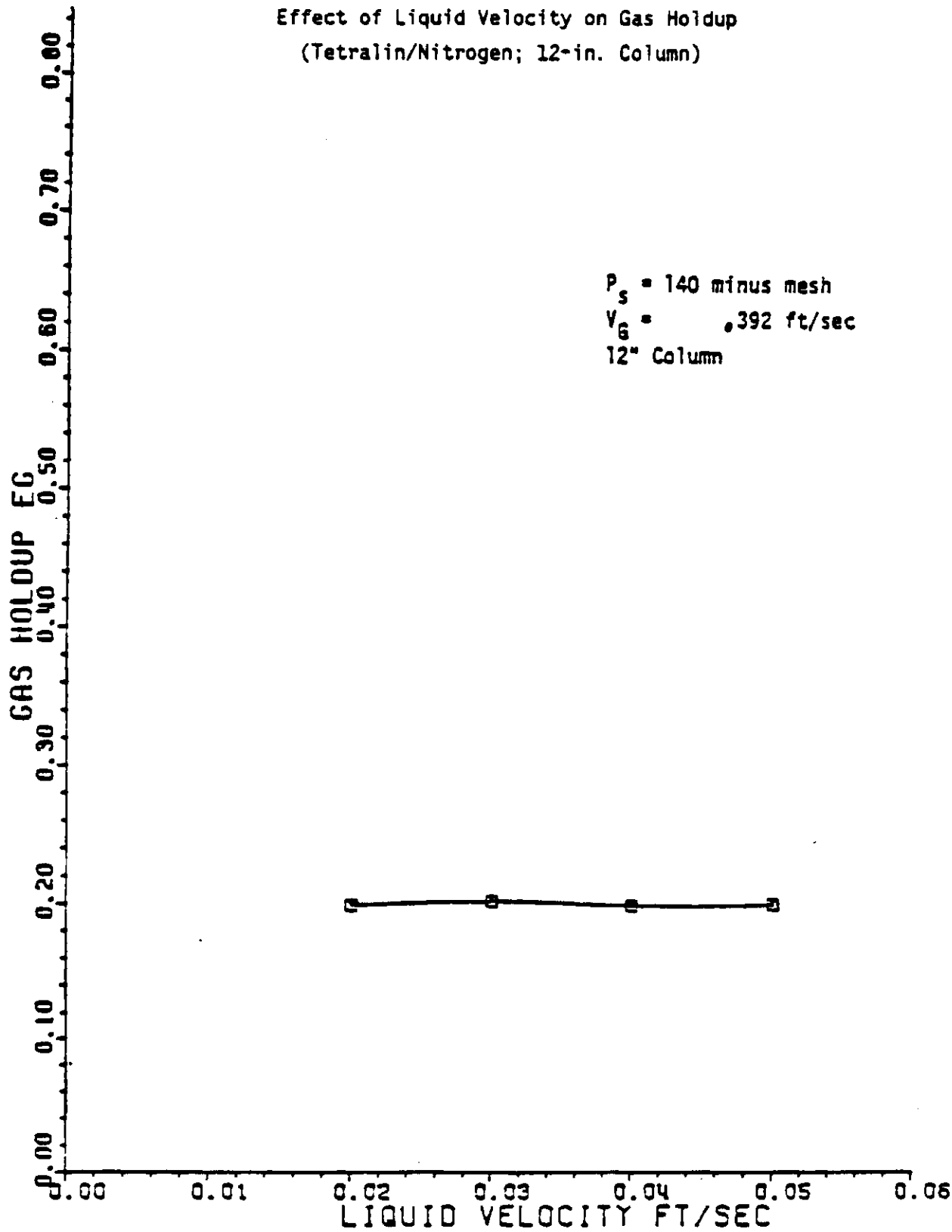


Figure 6

Effect of Gas Velocity on Gas Holdup

(Air/Water; 6-ft Column)

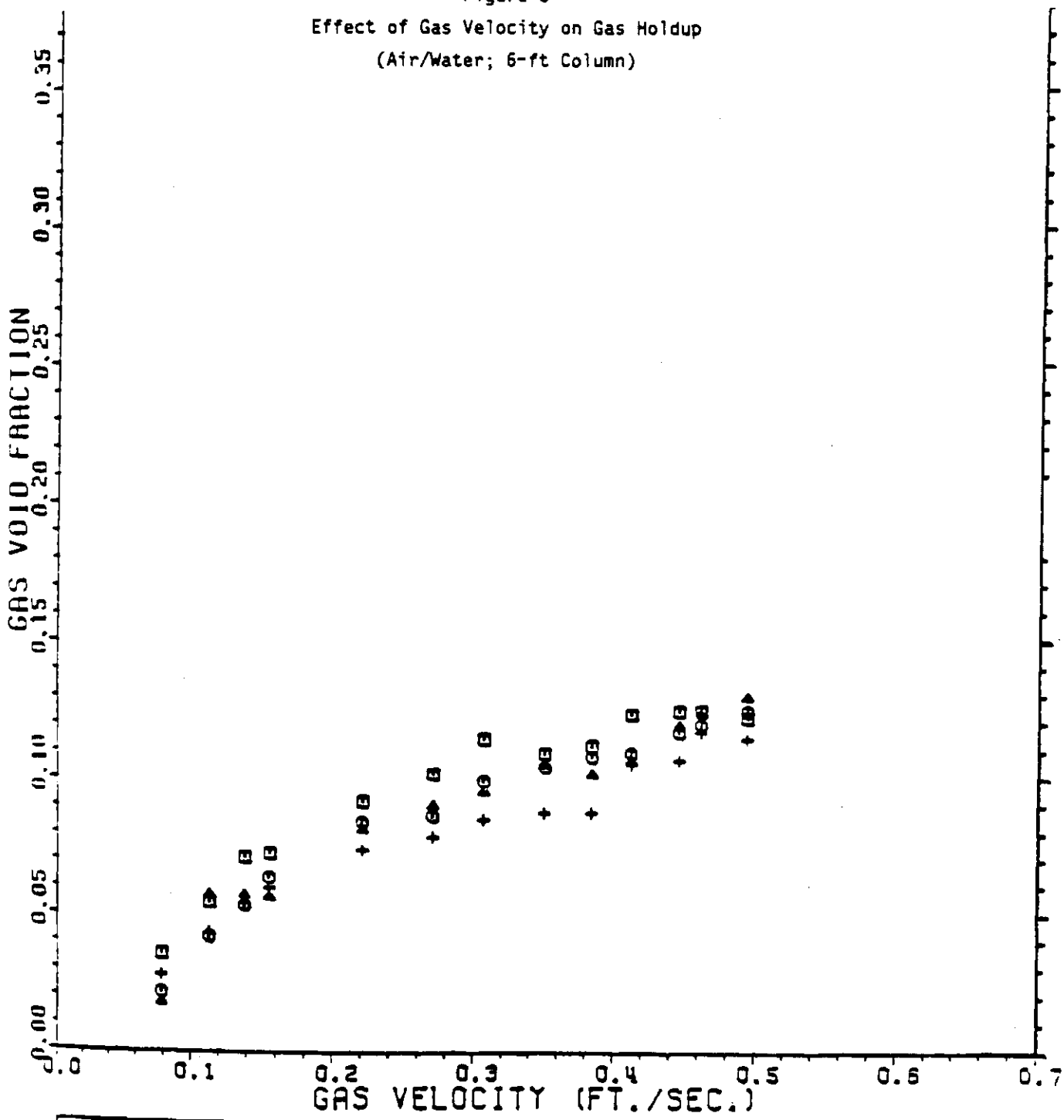


Figure 7

Effect of Solids on Gas Holdup

(Air/Water and Air/Water/Sand; 12-in. Column)

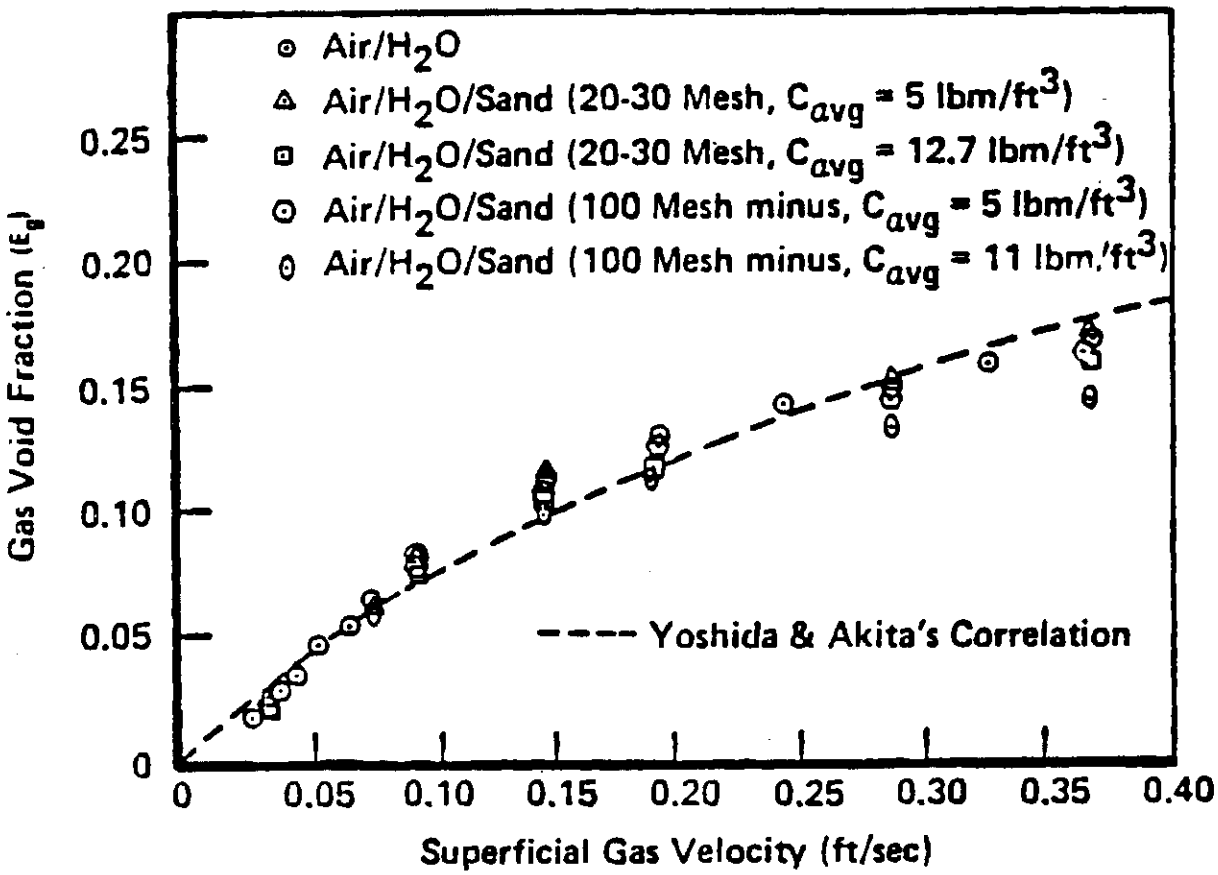


Figure 8

Effect of Solids on Gas Holdup

(Nitrogen/Tetralin/Sand; 12-in. Column)

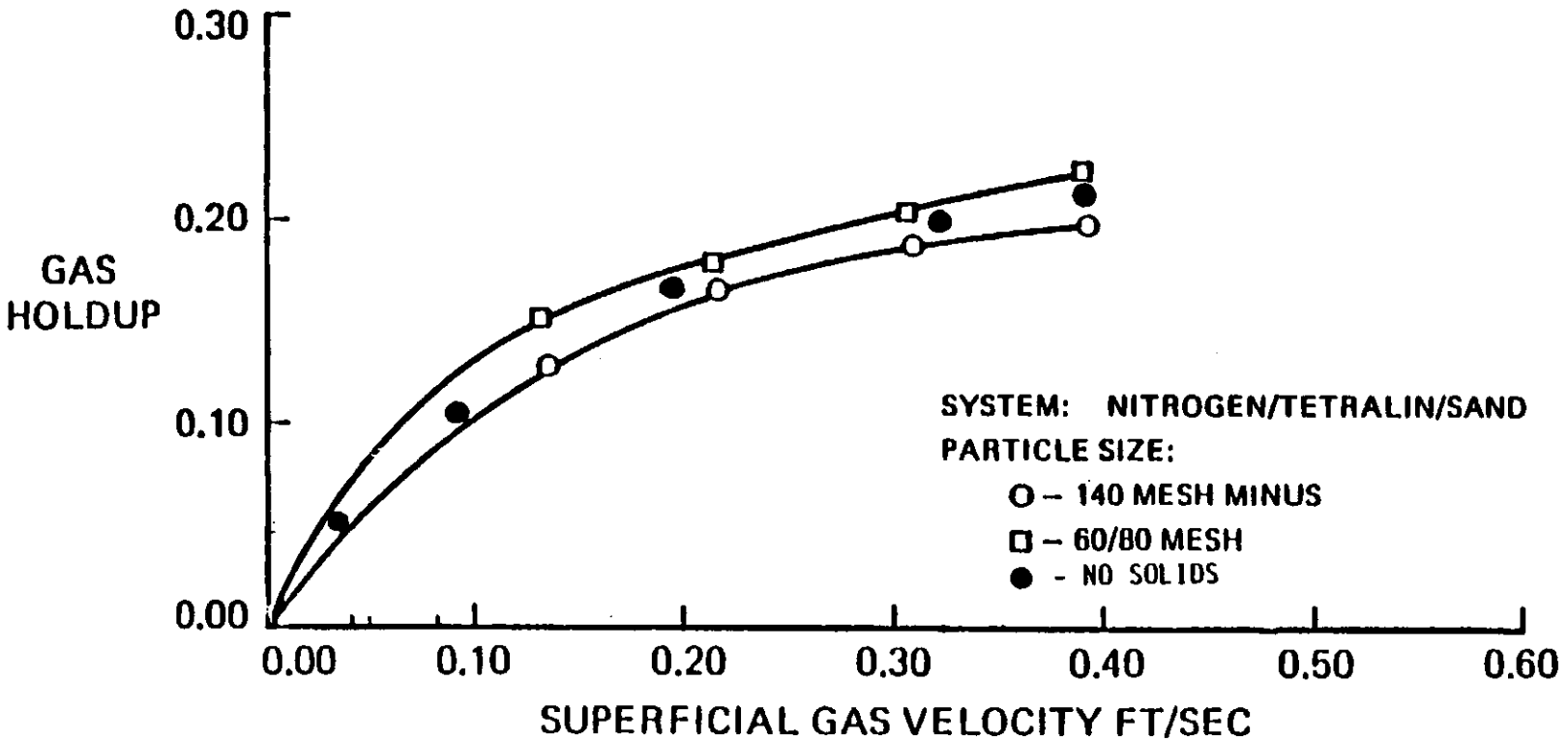


Figure 9
Effect of Distributor Plate on Gas Holdup in
the Absence of Liquid Flow and Solid Phase
(12-in. Column)

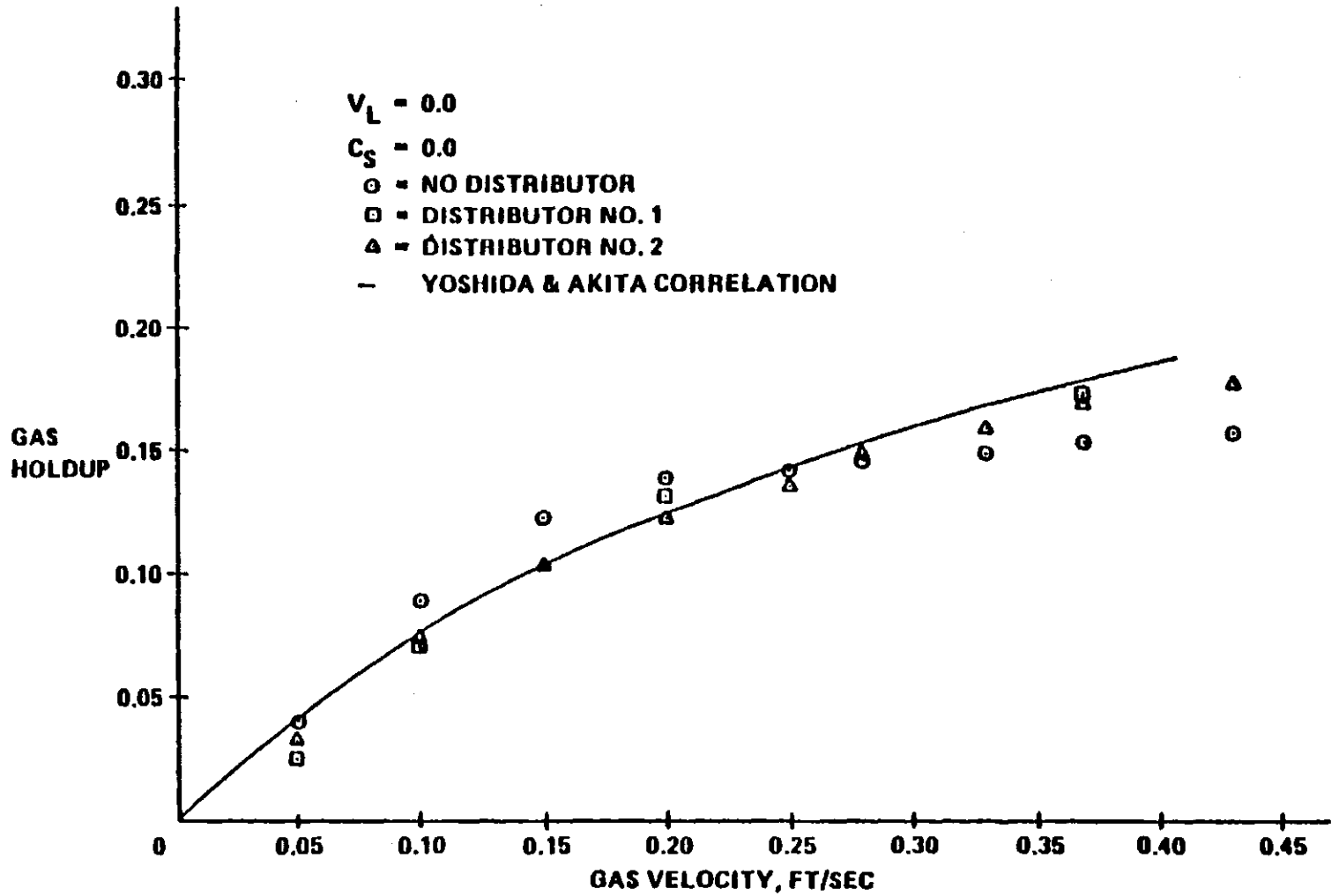


Figure 10
Effect of Distributor Plate on Gas Holdup at
Low Liquid Velocity with High Concentration
of Large Solid Particles (12-in. Column)

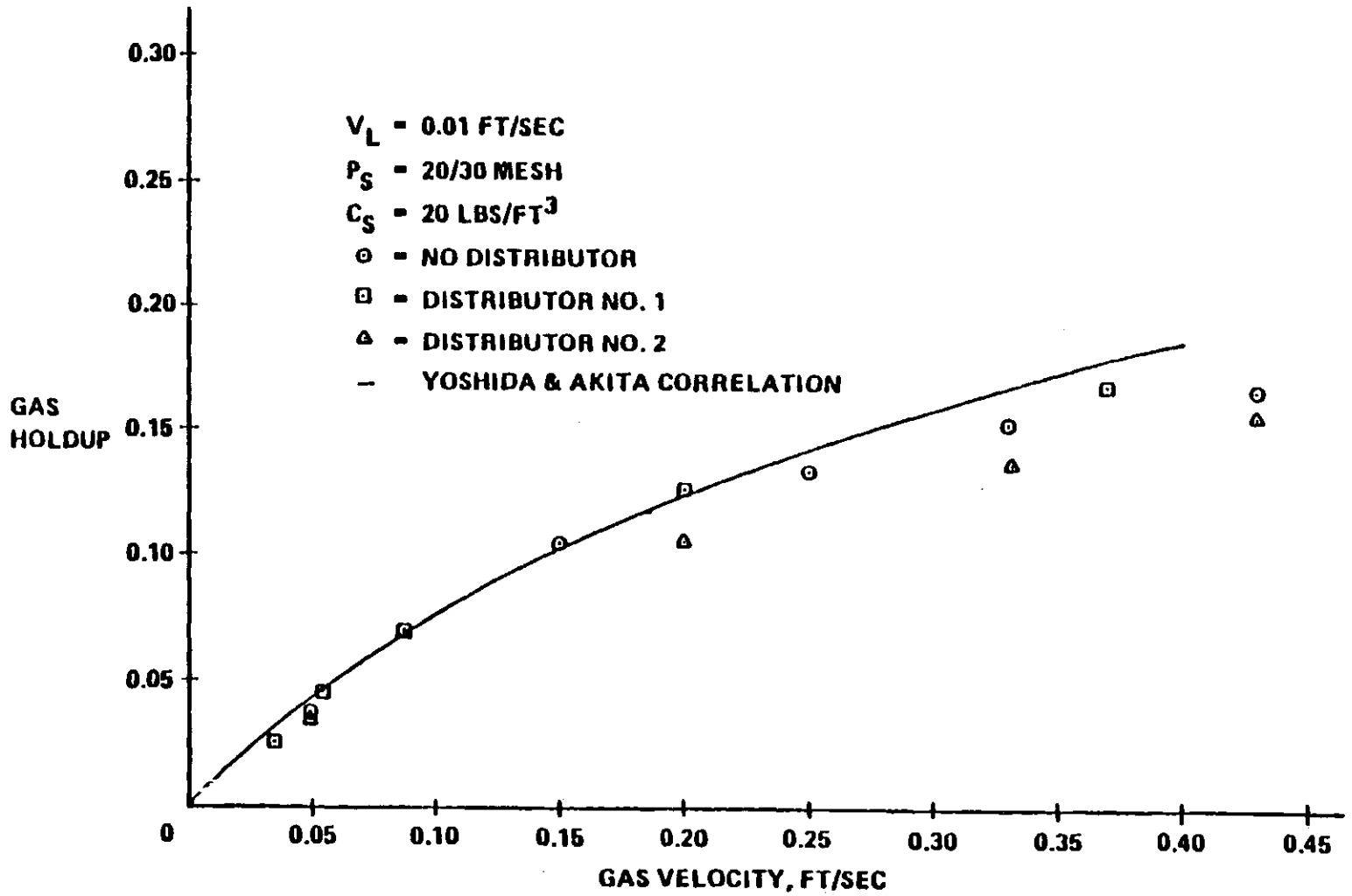


Figure 11

Effect of Distributor Plate on Gas Holdup at High Liquid Velocity with Low Concentration of Large Solid Particles (12-in. Column)

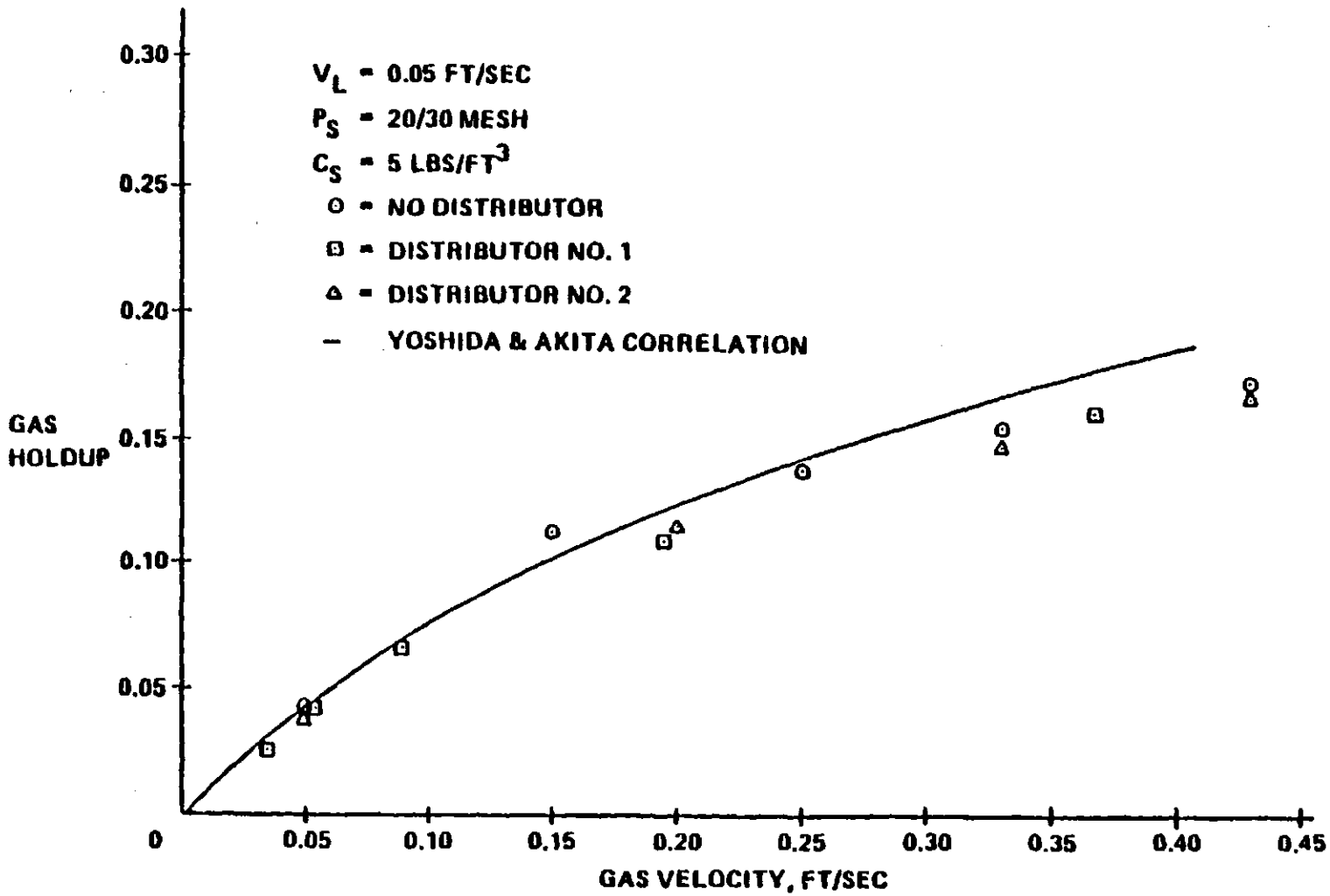


Figure 12

Effect of Distributor Plate on Gas Holdup at

Low Liquid Velocity with No Solids (12-in. Column)

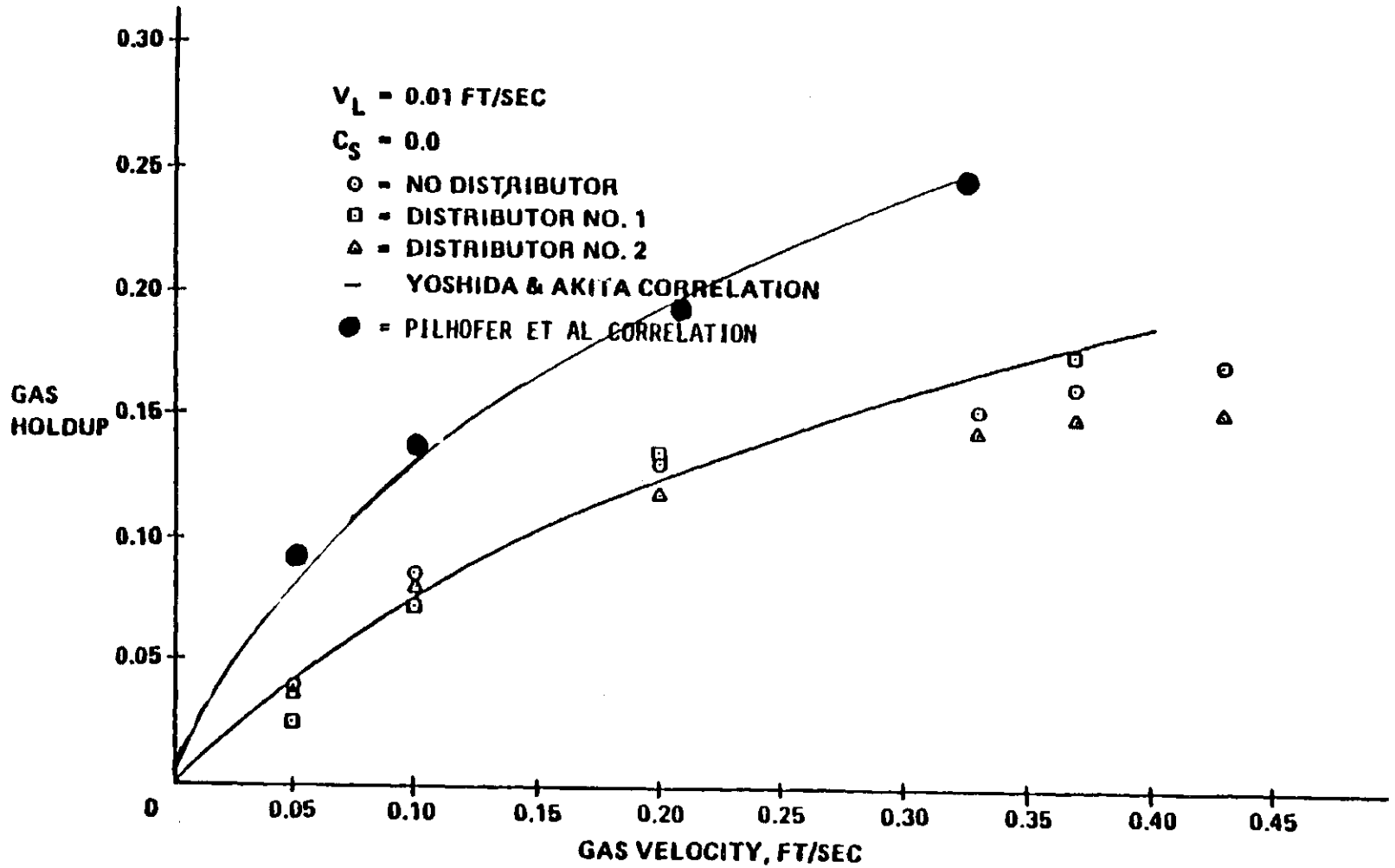


Figure 13

Effect of Distributor Plate on Gas Holdup at High Liquid Velocity with Low Concentration of Fine Particles (12-in. Column)

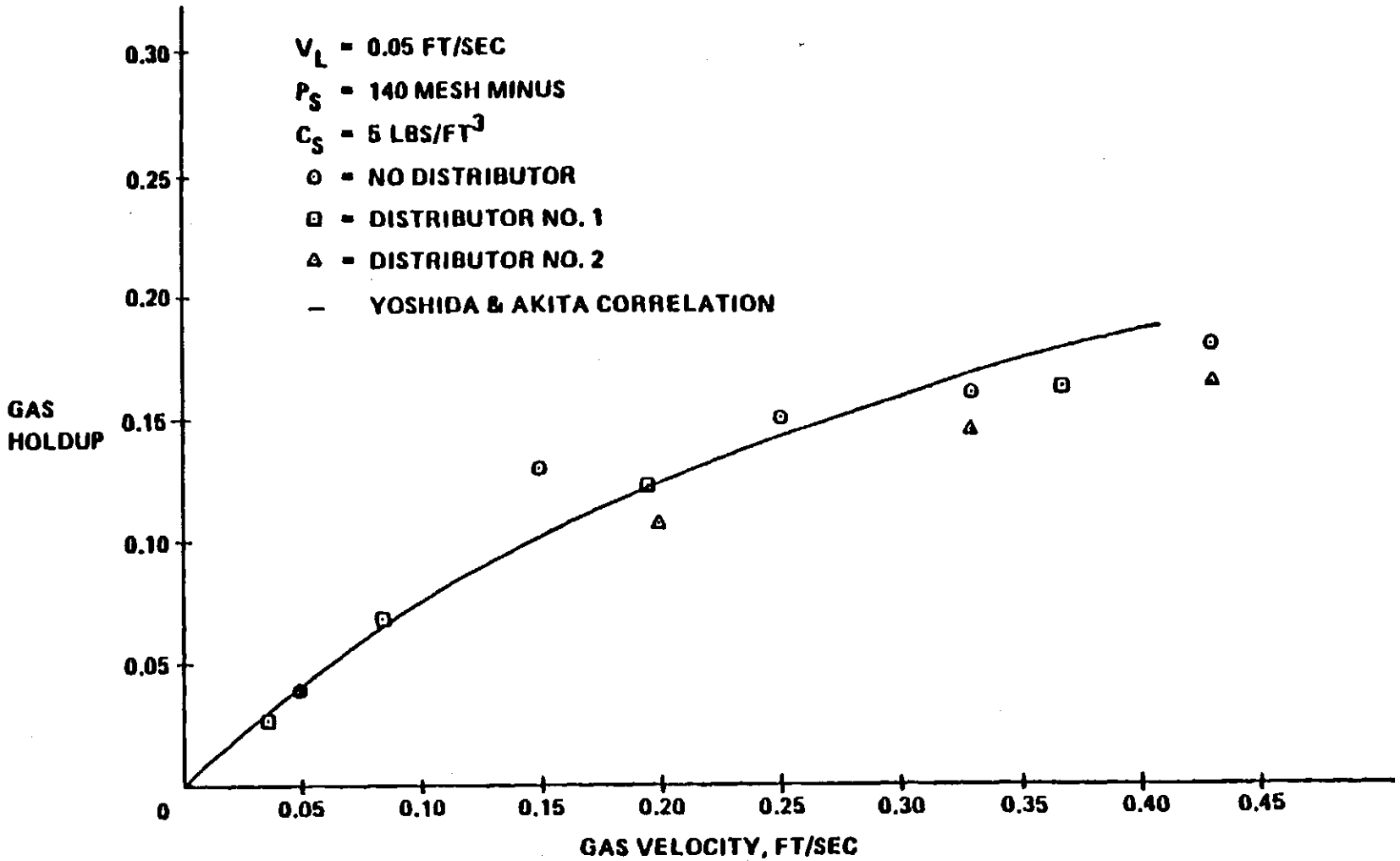


Figure 14
Effect of Distributor Plate on Gas Holdup at
Low Liquid Velocity with High Concentration of
Fine Particles (12-in. Column)

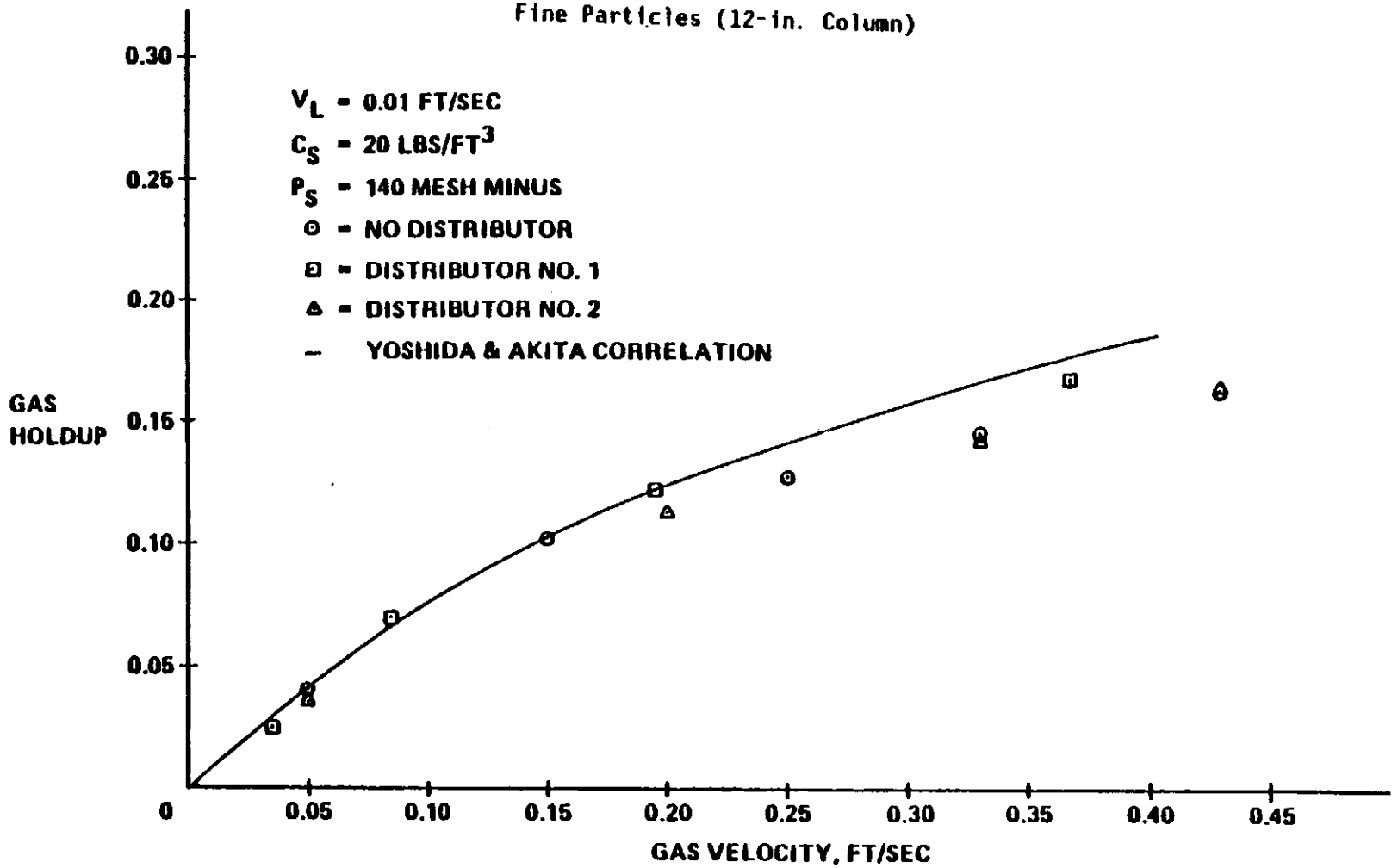


Figure 15

Effect of Different Internals on Gas Holdup (6-ft Column)

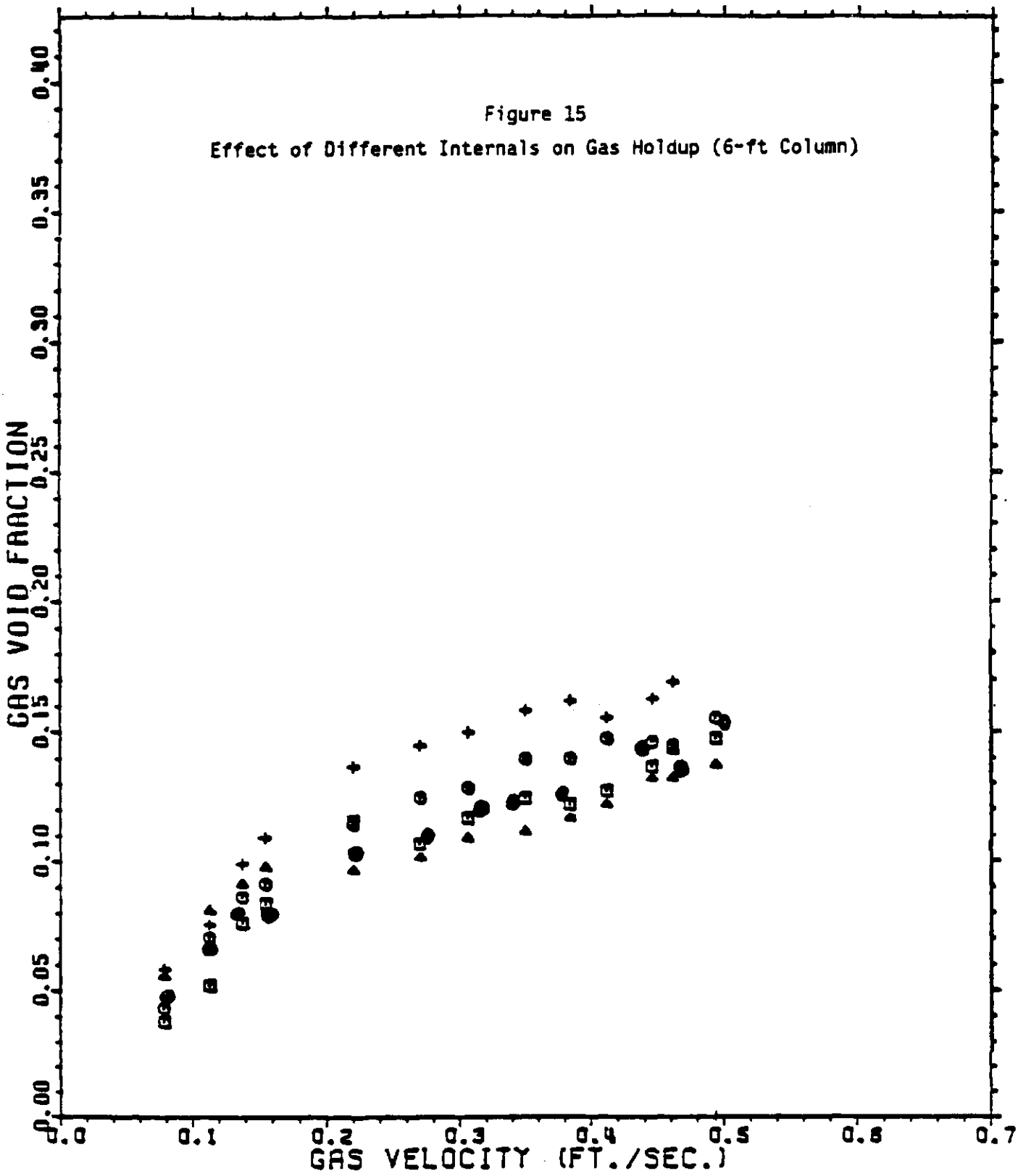


Figure 16

Comparison of Hughmark's, Pilhofer's, and
Akita and Yoshida's Correlations for the Data from
5- and 12-in. Columns (Tetralin/Nitrogen)

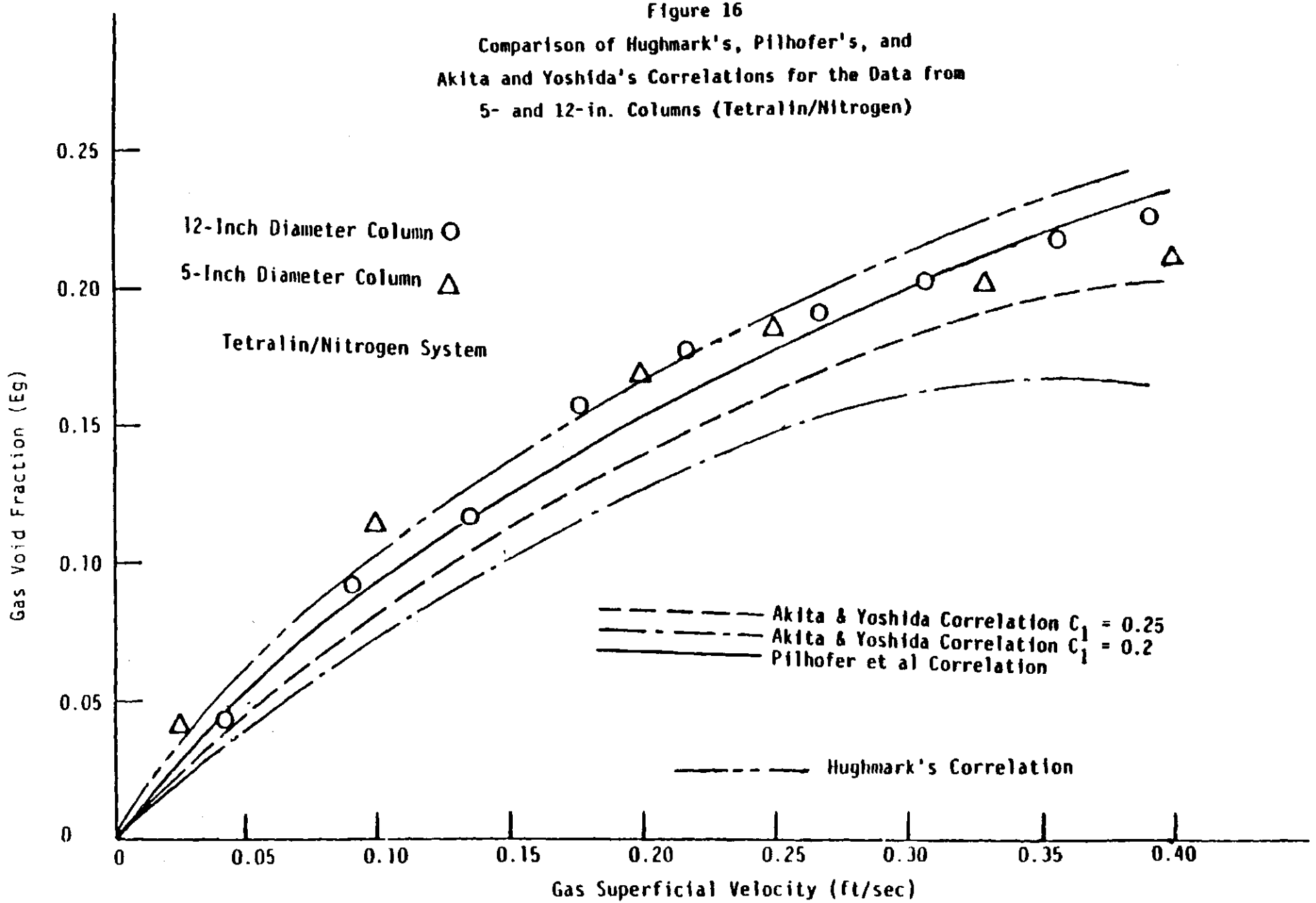


Figure 17
Comparison of Correlations with Experimental
Data (100% Glycol; 12-in. Column)

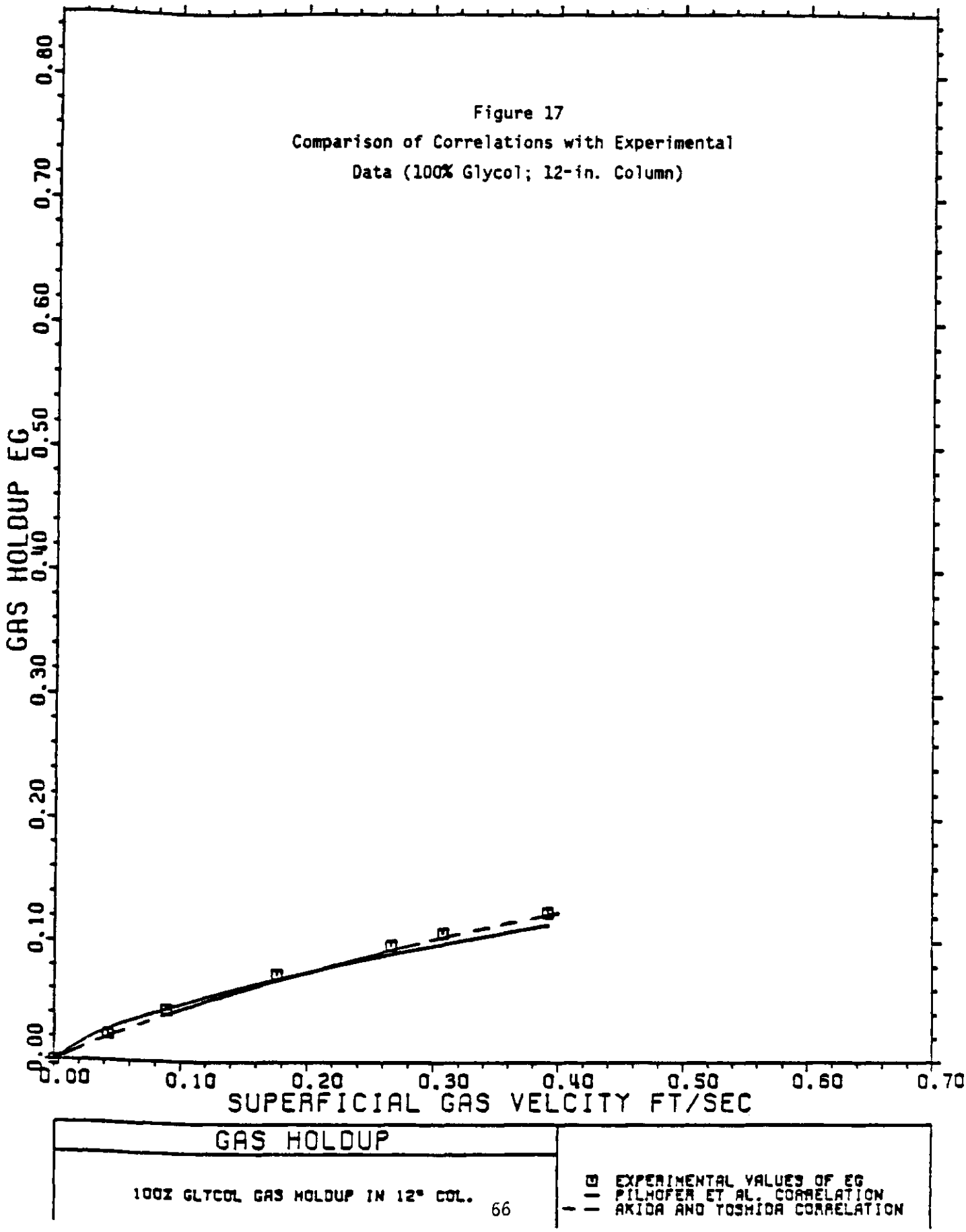


Figure 18
Comparison of Correlations with Experimental Data
(90% Glycol; 12-in. Column)

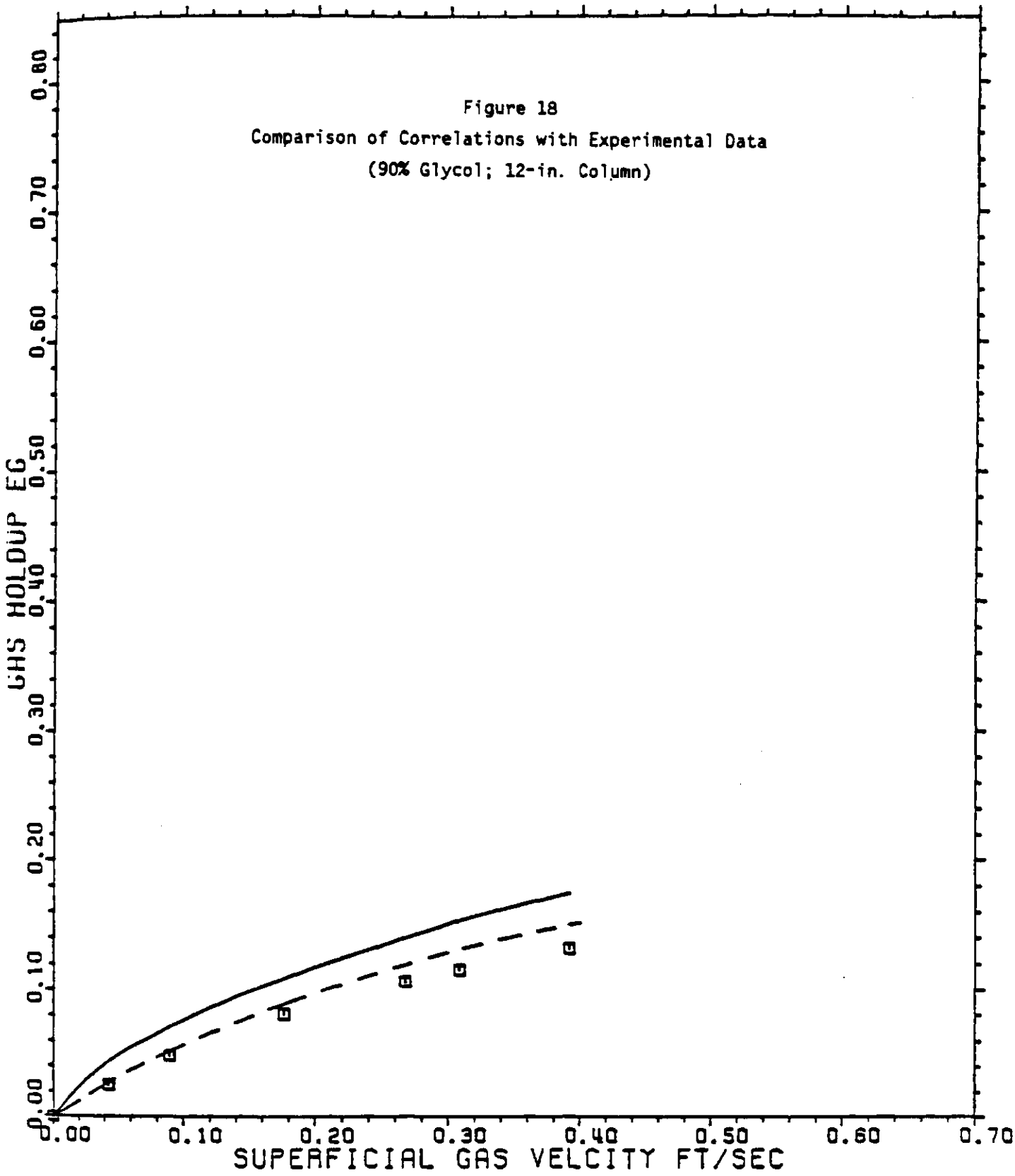


Figure 19
Comparison of Correlations with Experimental Data
(70% Glycol; 12-in. Column)

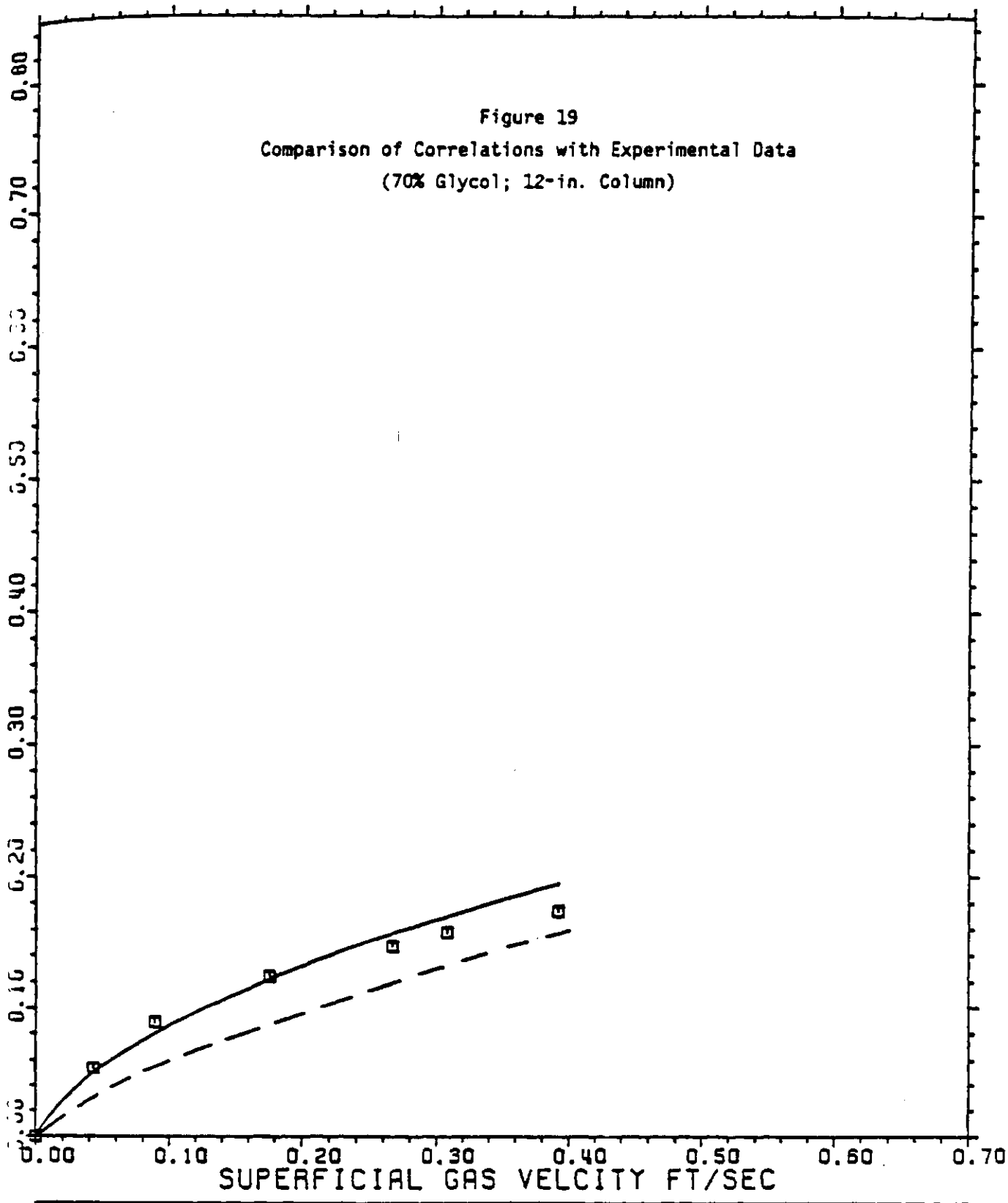


Figure 20

Comparison of Correlations with Experimental Data

(50% Glycol; 12-in. Column)

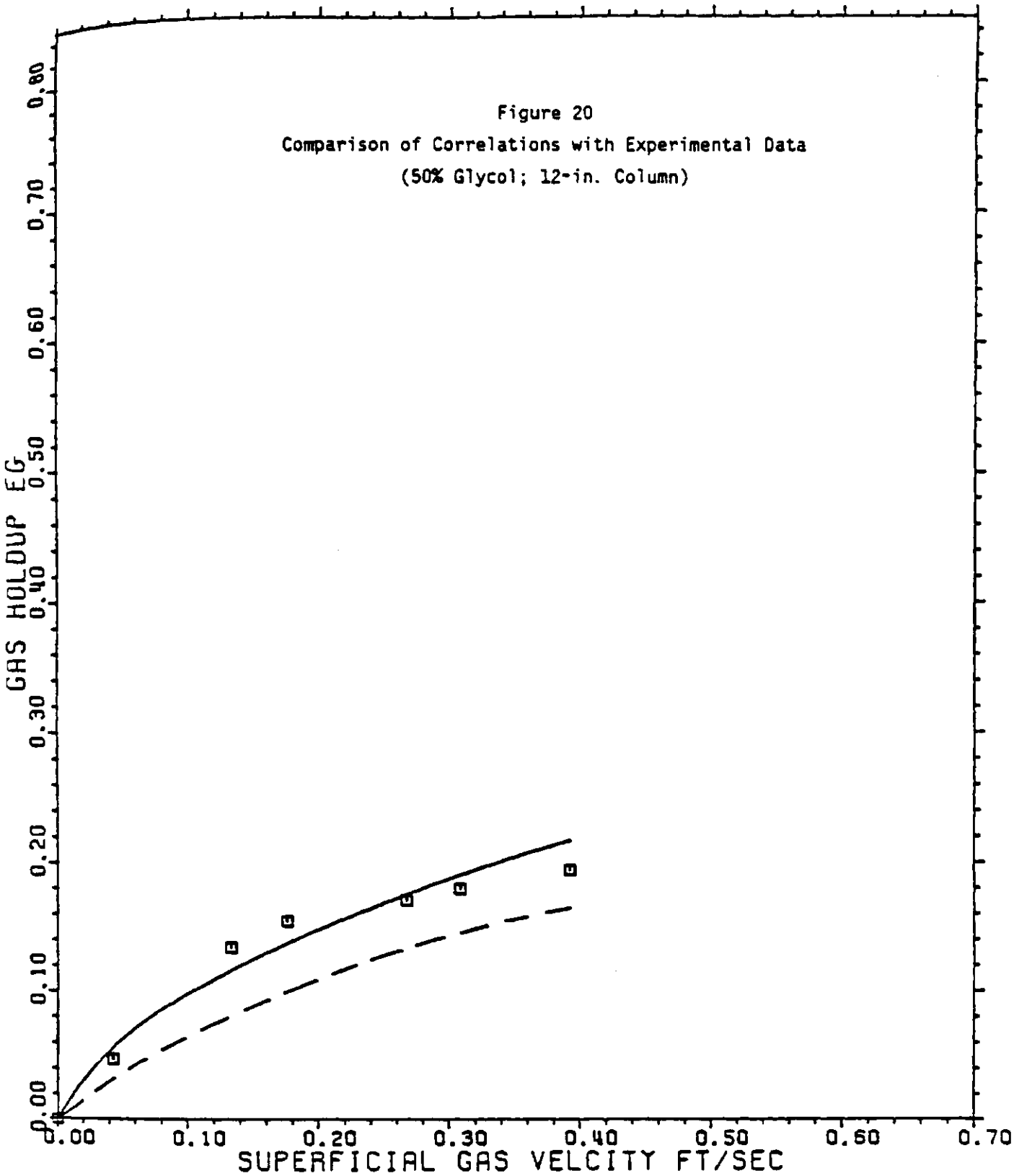


Figure 21

Variation of Gas Holdup at Elevated Pressures

(Exxon's 1-tpd Pilot Plant; 2.6-in.-Diameter Vessel)

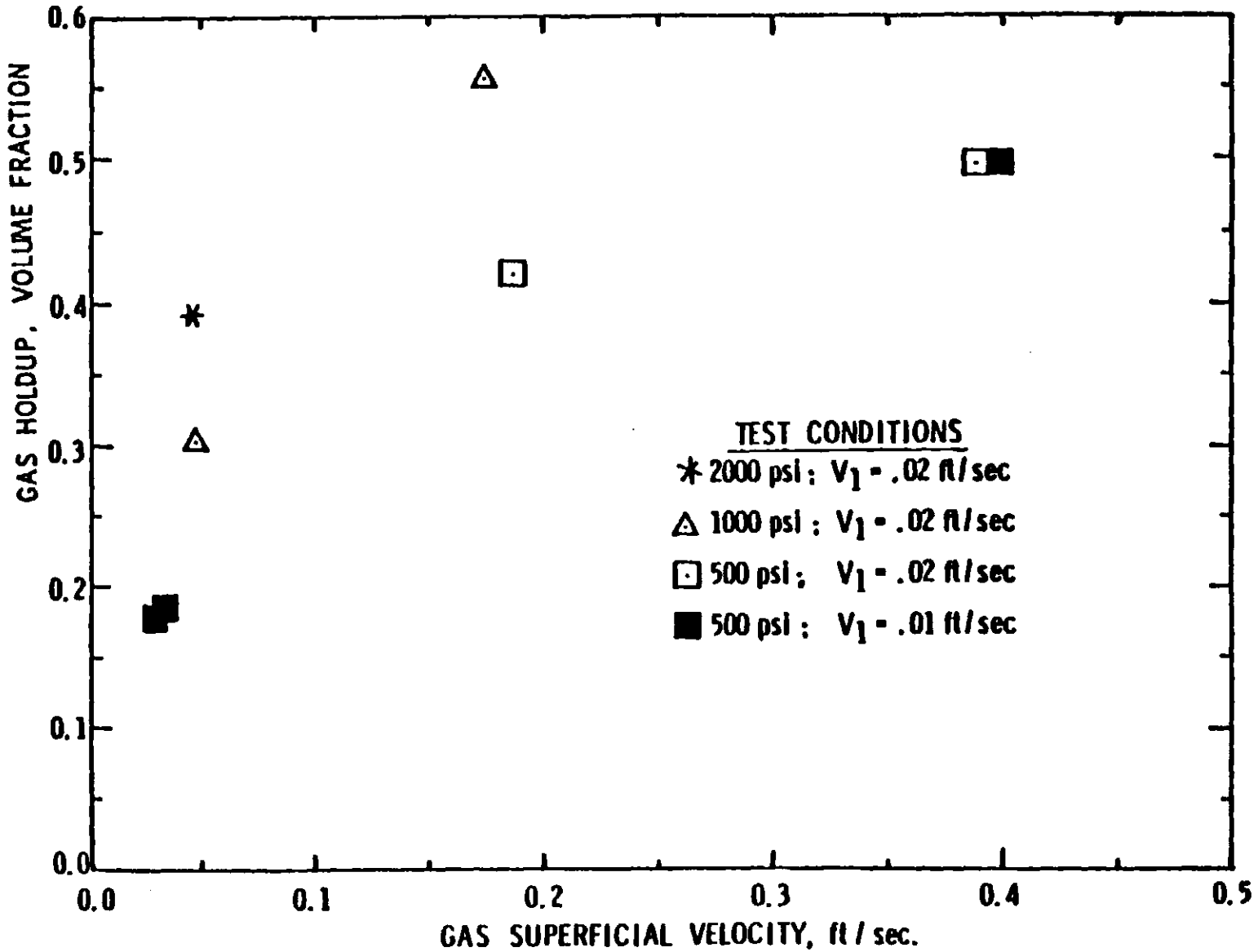


Figure 22

Gas Holdup in Exxon Donor Solvent Reactors from Tracer Data (250-tpd Pilot Plant; 2-ft-Diameter Dissolver, 2.6-in. CLPP and 1-in. RCLU)

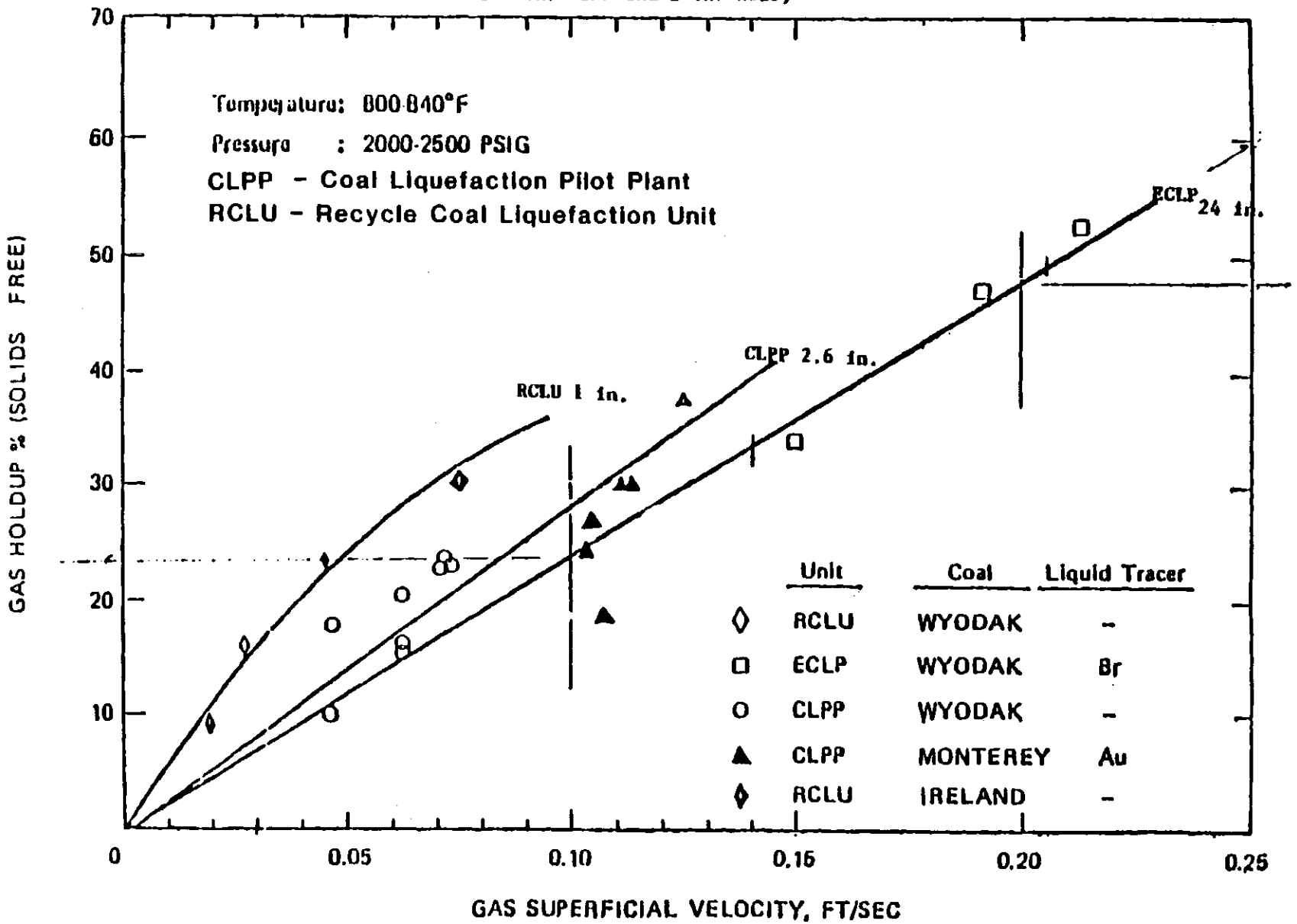


Figure 23
Log/Log Plot of Liquid Axial Dispersion Coefficient vs.
Gas Velocity (12-in. Column; Air/Water)

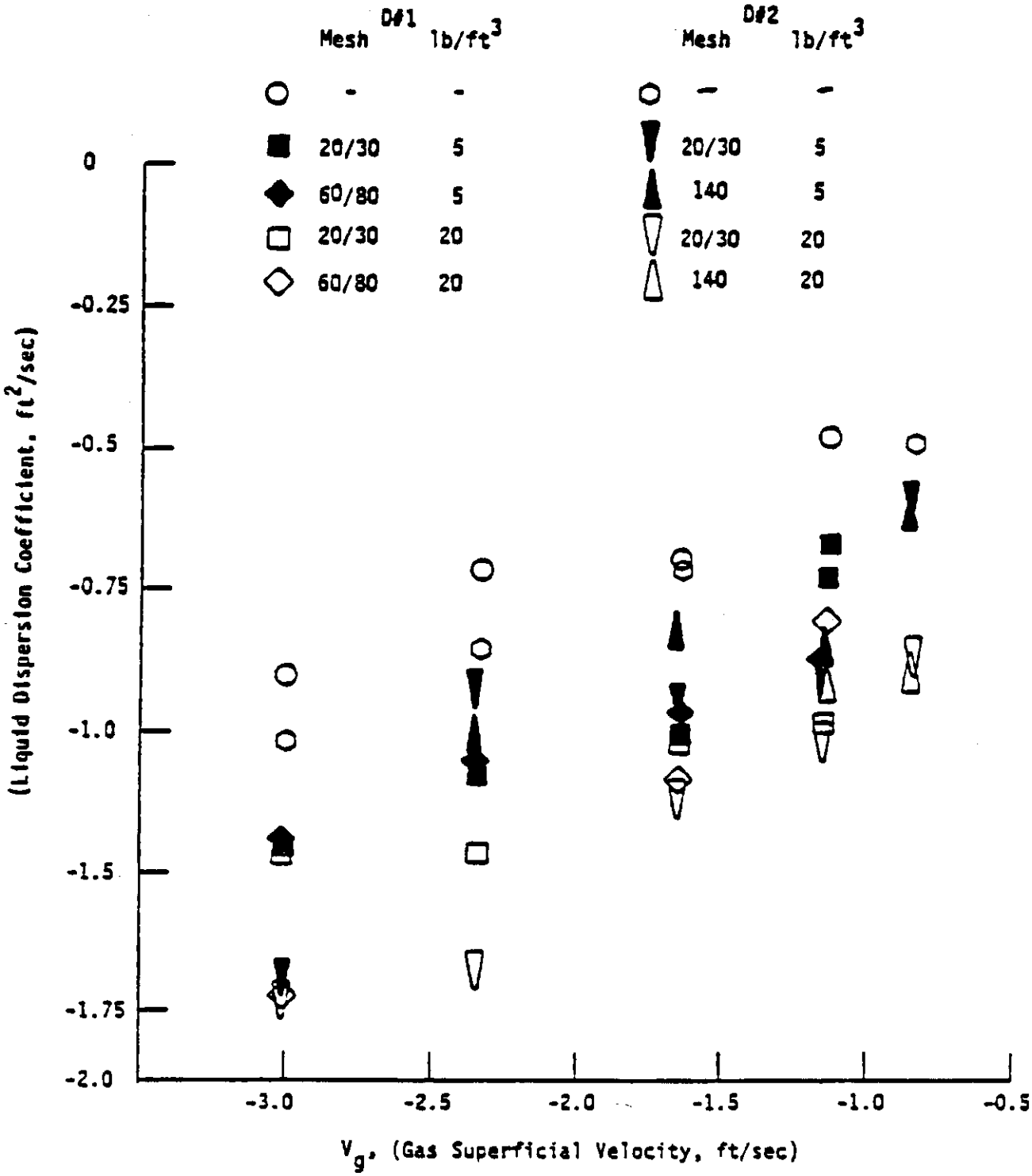


Figure 24

Effect of Gas Velocity on Axial Liquid Dispersion Coefficient

(12-in. Column; Tetralin/Nitrogen)

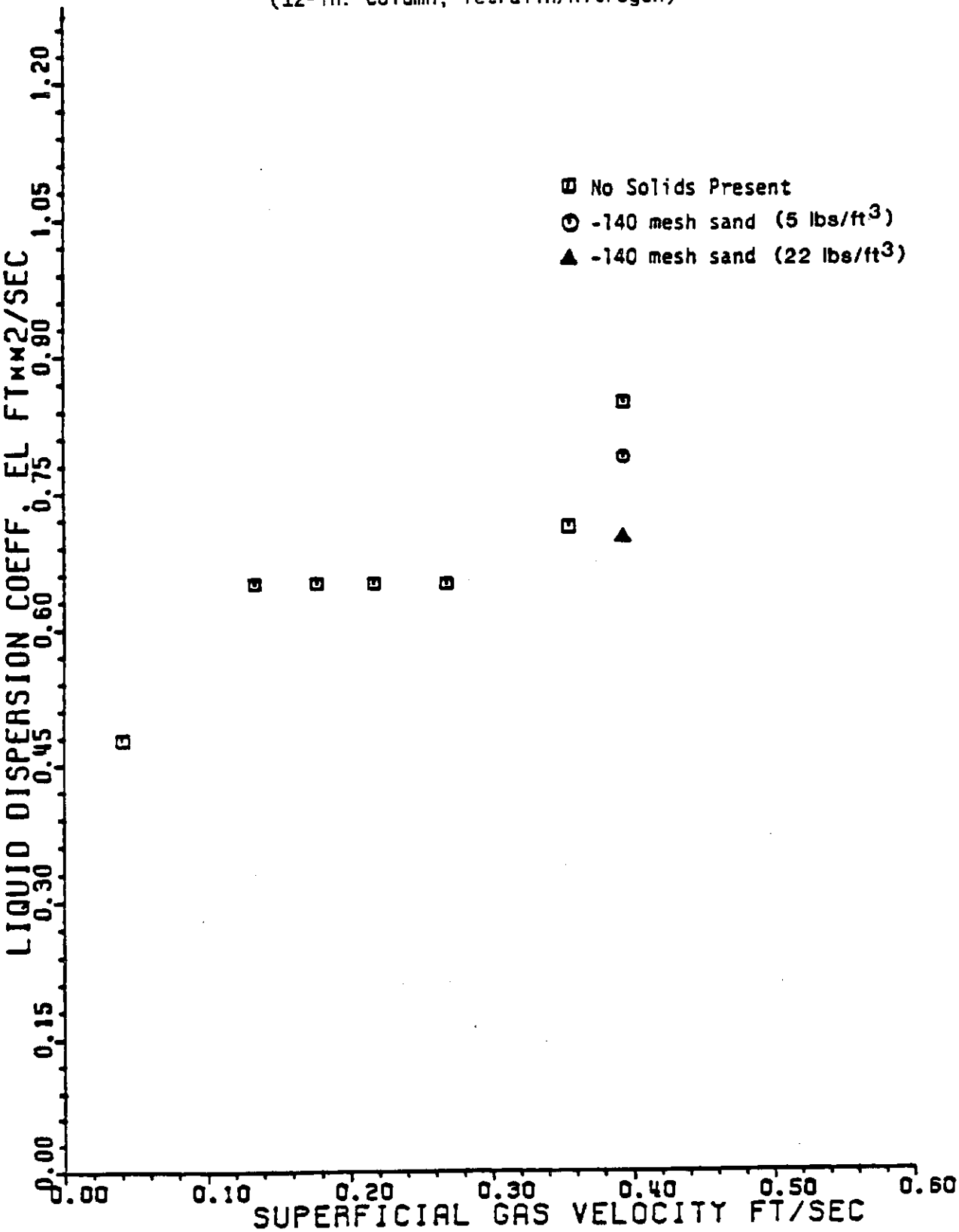


Figure 25
Comparison of E_{ZL} for Batch and Continuous Experiments (50% Glycol/Air; 12-in. Column)

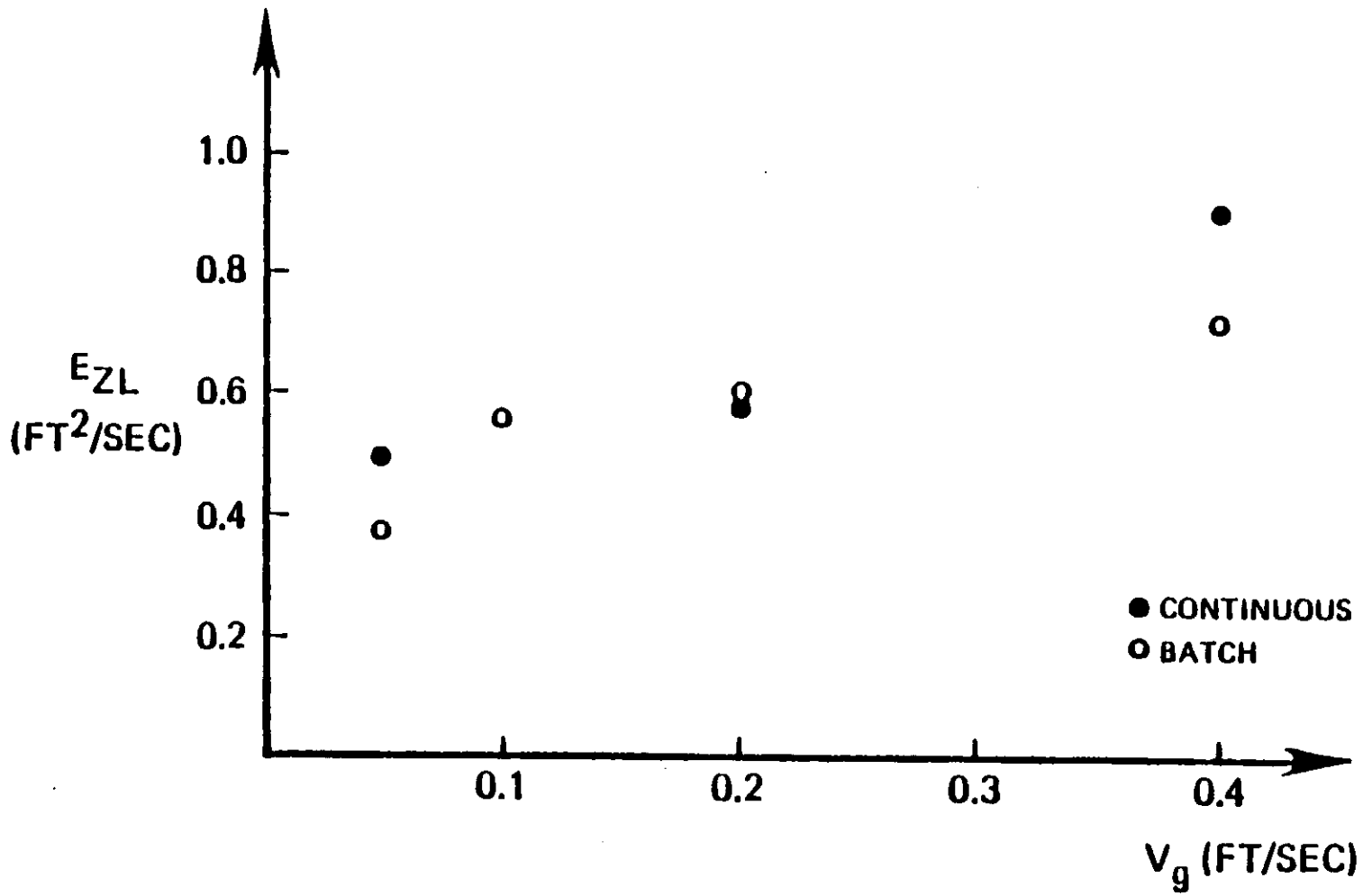


Figure 26
Axial Liquid Dispersion Coefficients vs.
Gas Velocity (6-ft Column)

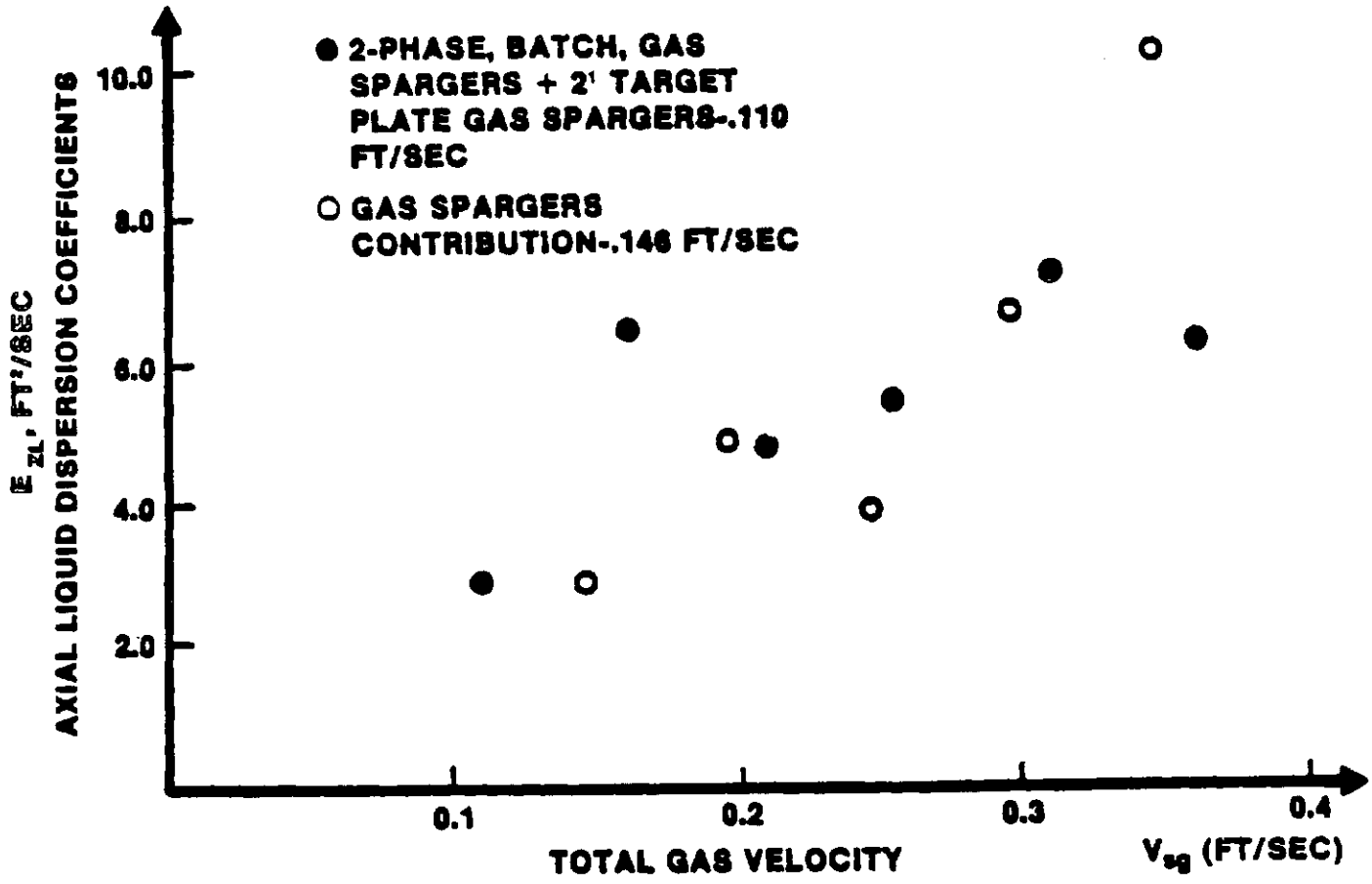


Figure 27

Plots of E_{ZL} (Experimental and Correlation) vs. Superficial Gas Velocity for the 12-in. and 6-ft Columns

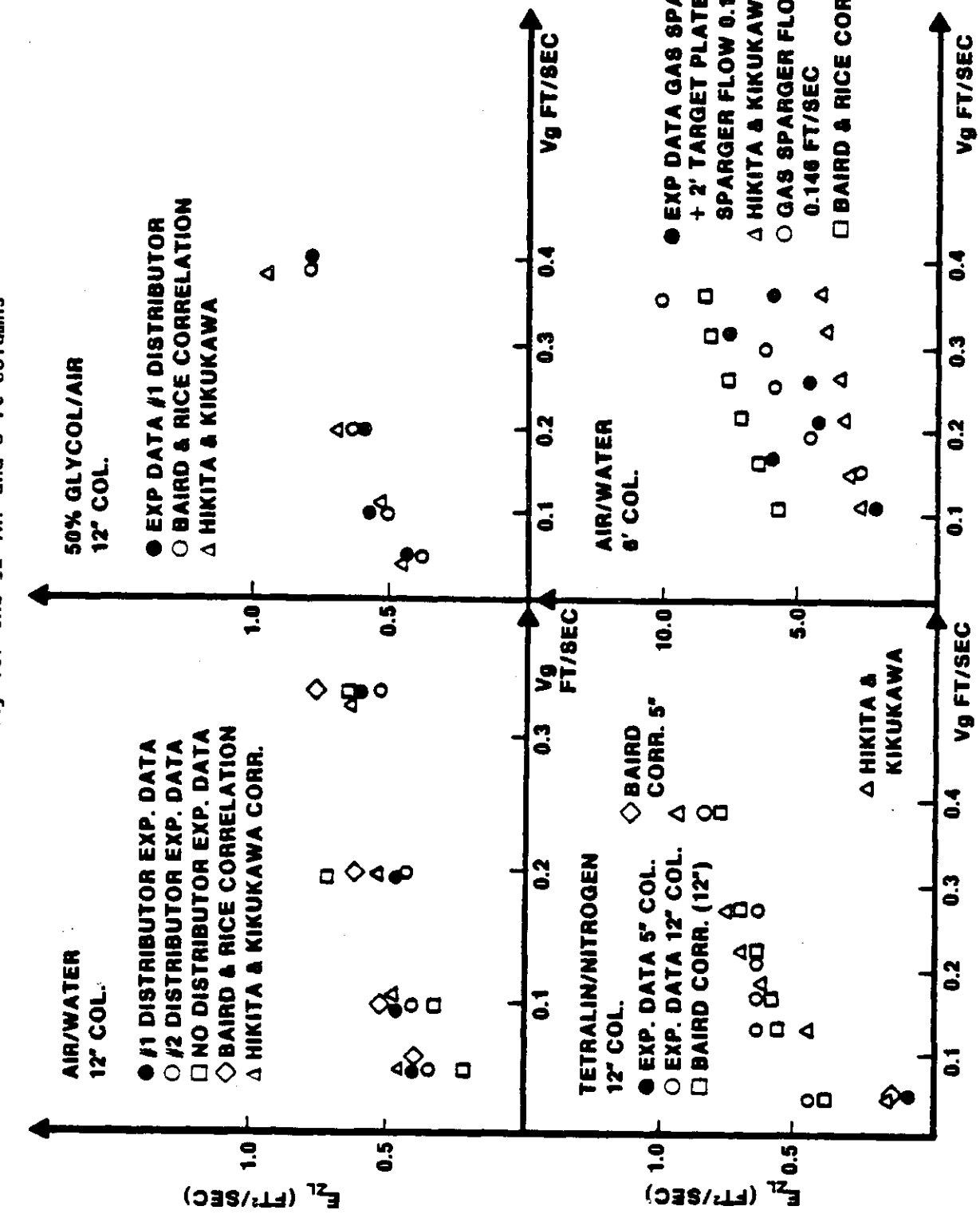


Figure 28

Effect of Solids on Gas/Liquid Mass-Transfer Coefficients
(5-in. Column; Air/Water and Air/Water/Sand)

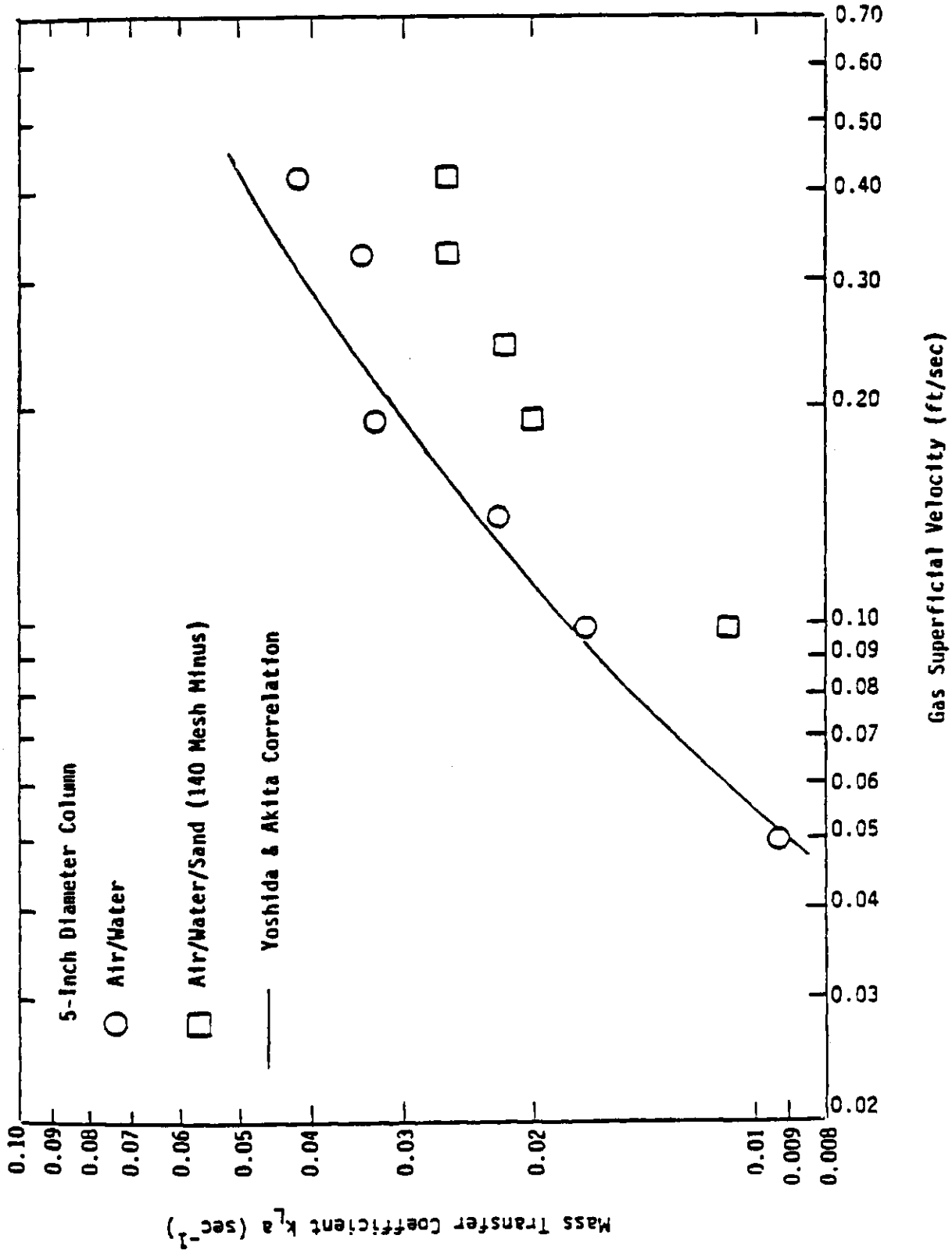


Figure 29

Effect of Distributors on Gas/Liquid Mass Transfer

in a 12-in. Column

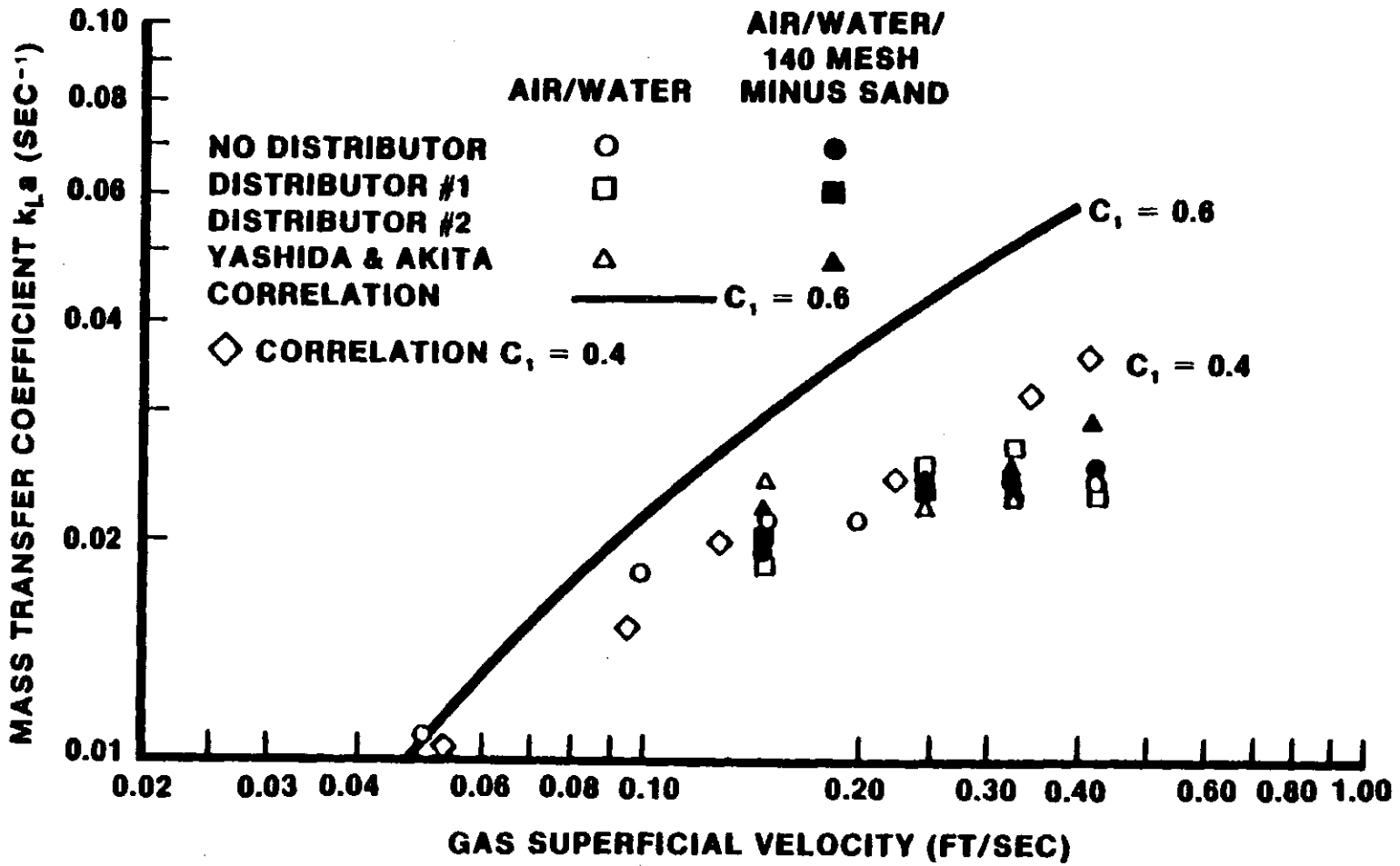


Figure 30
Effect of Varying Gas Velocity through Spargers on
Gas/Liquid Volumetric Mass-Transfer
Coefficient in a 6-ft Column

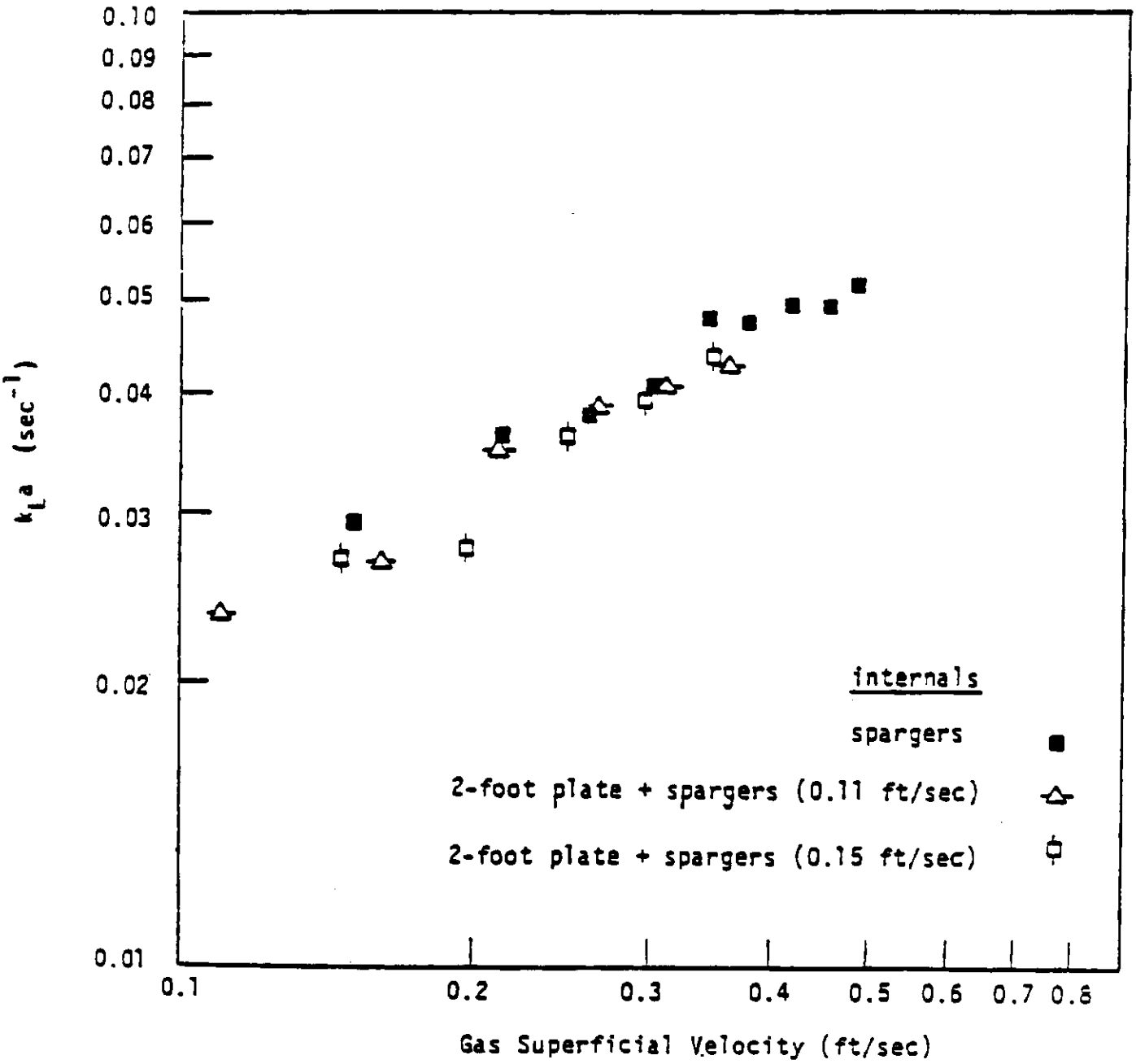


Figure 31
Effect of Different Internals on Gas/Liquid Volumetric
Mass-Transfer Coefficient in a 6-ft Column

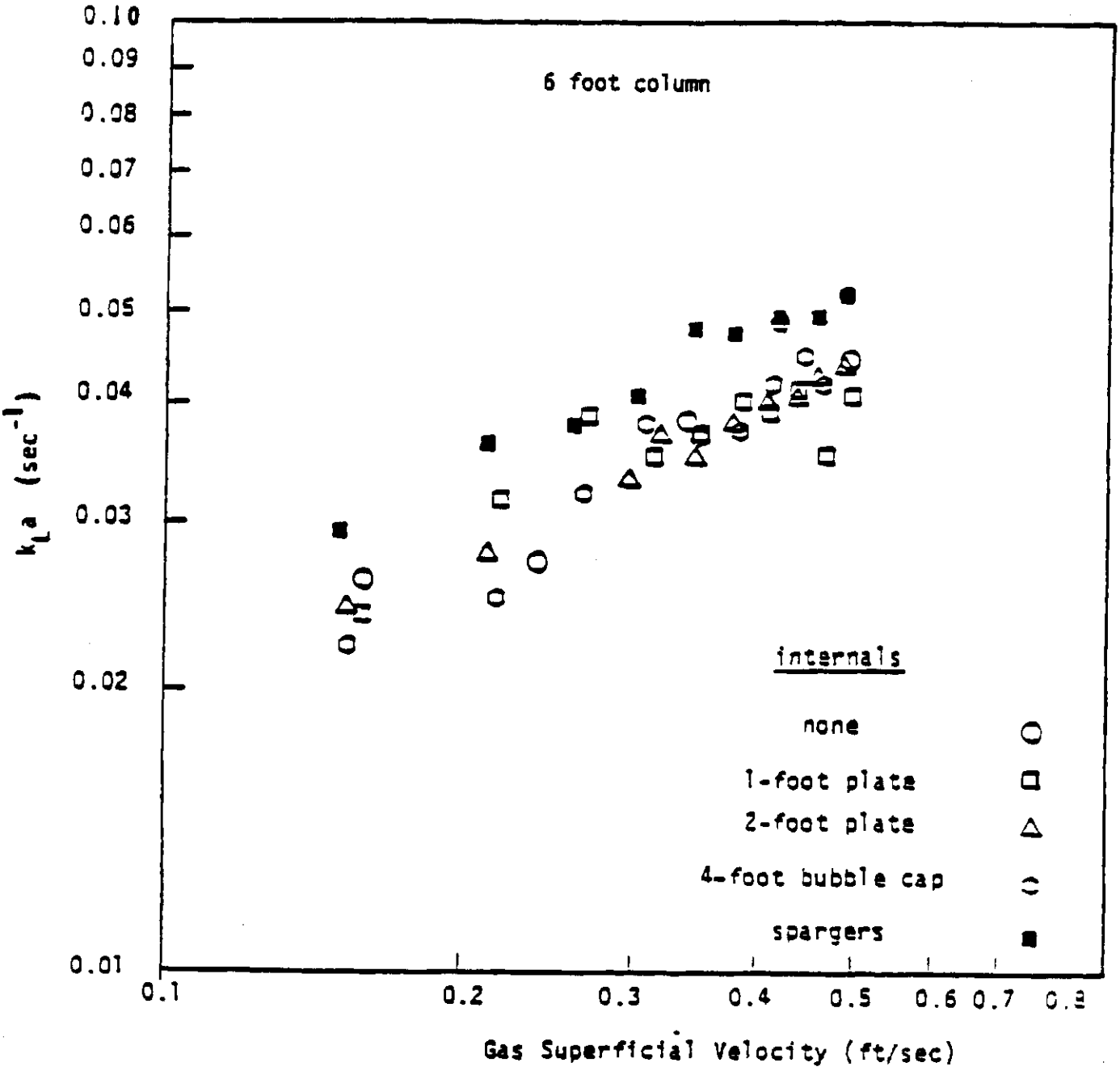


Figure 32
Effect of Solids on Gas/Liquid Volumetric
Mass-Transfer Coefficient (6-ft Column)

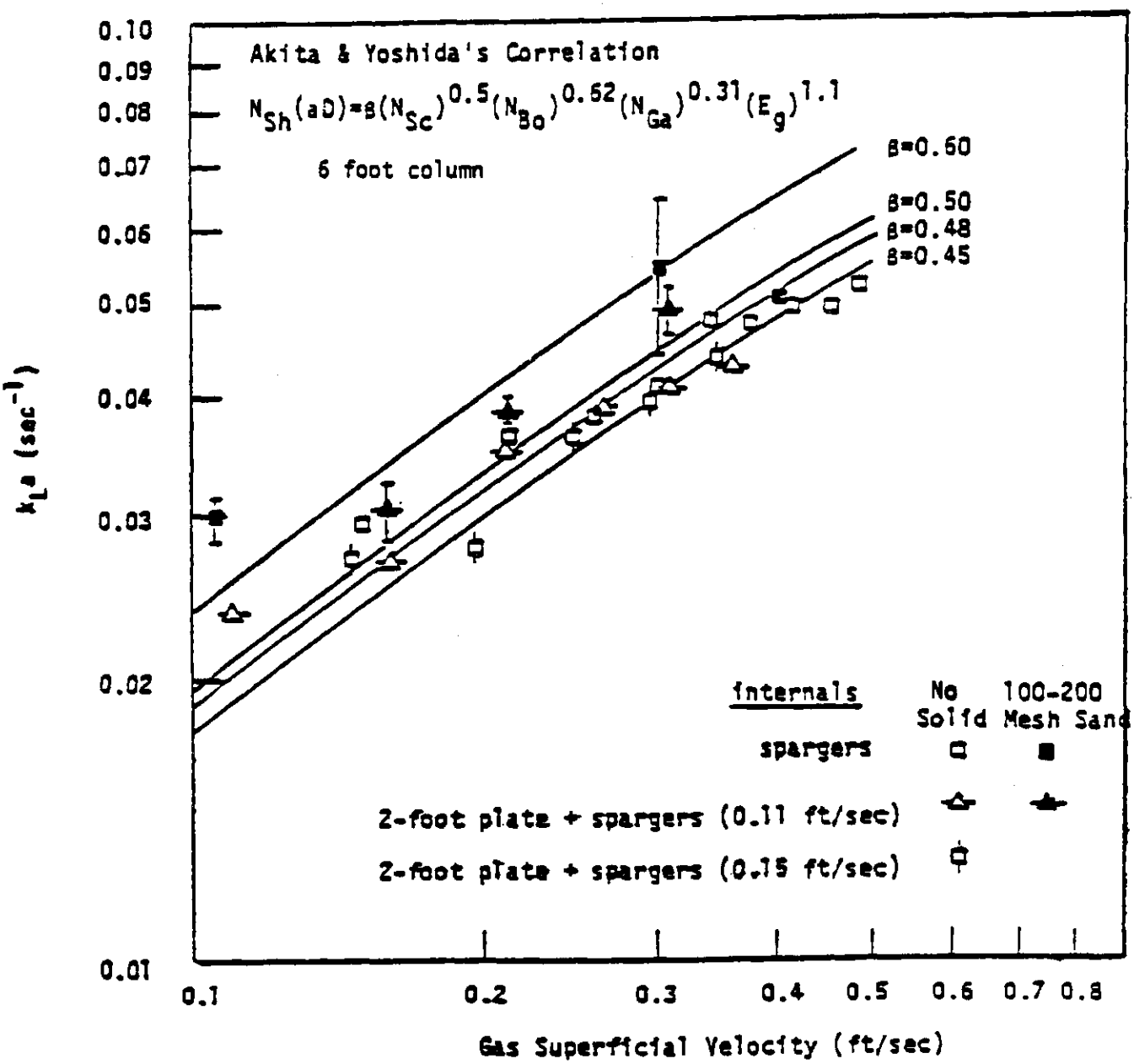


Figure 33

Effect of Gas Velocity on Concentration vs. Length in a 5-in. Column (Batch Mode, 140/170-Mesh Glass Beads)

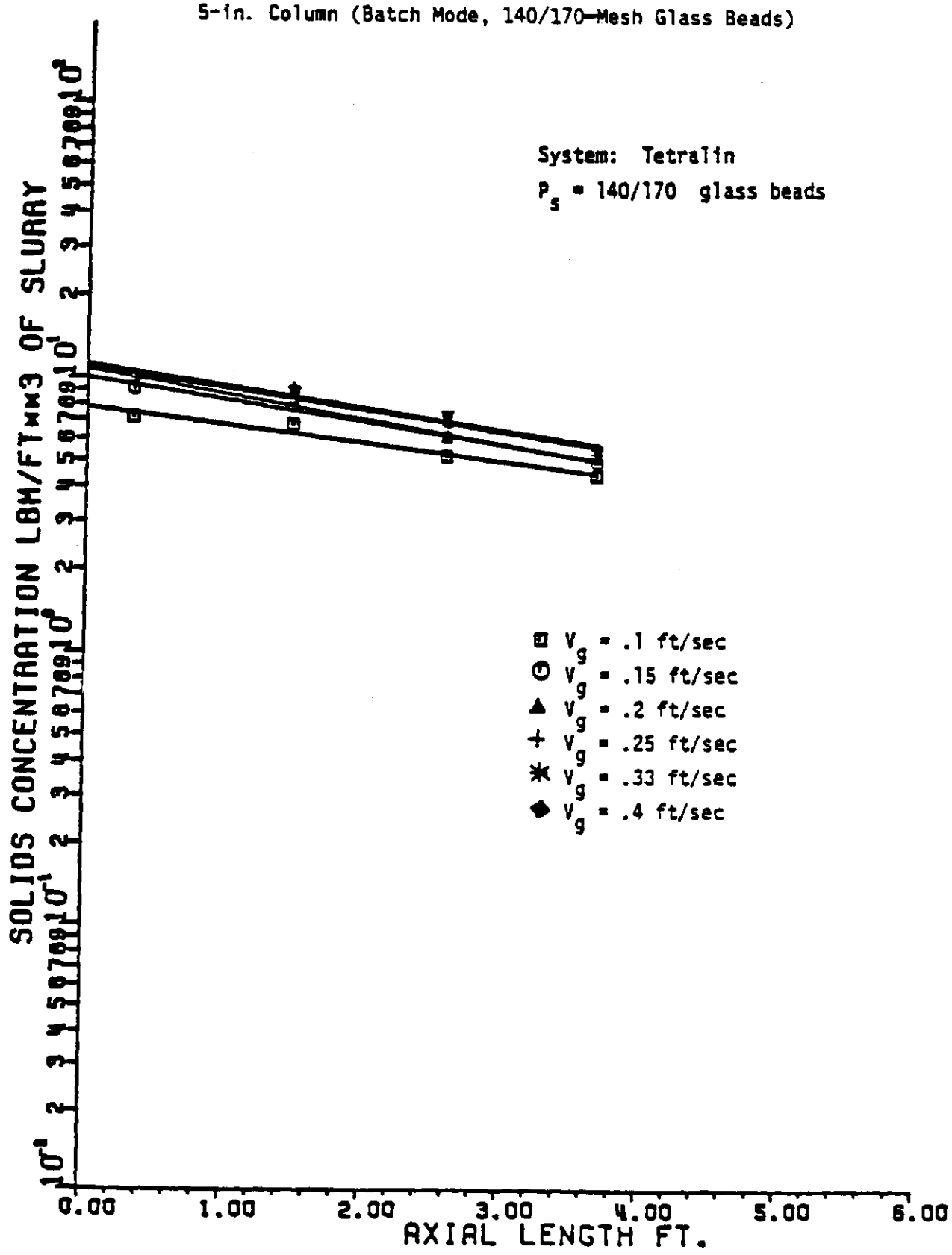


Figure 34

Effect of Gas Velocity on Concentration vs. Length in a 12-in. Column (Batch Mode; Tetralin/-140-Mesh Sand)

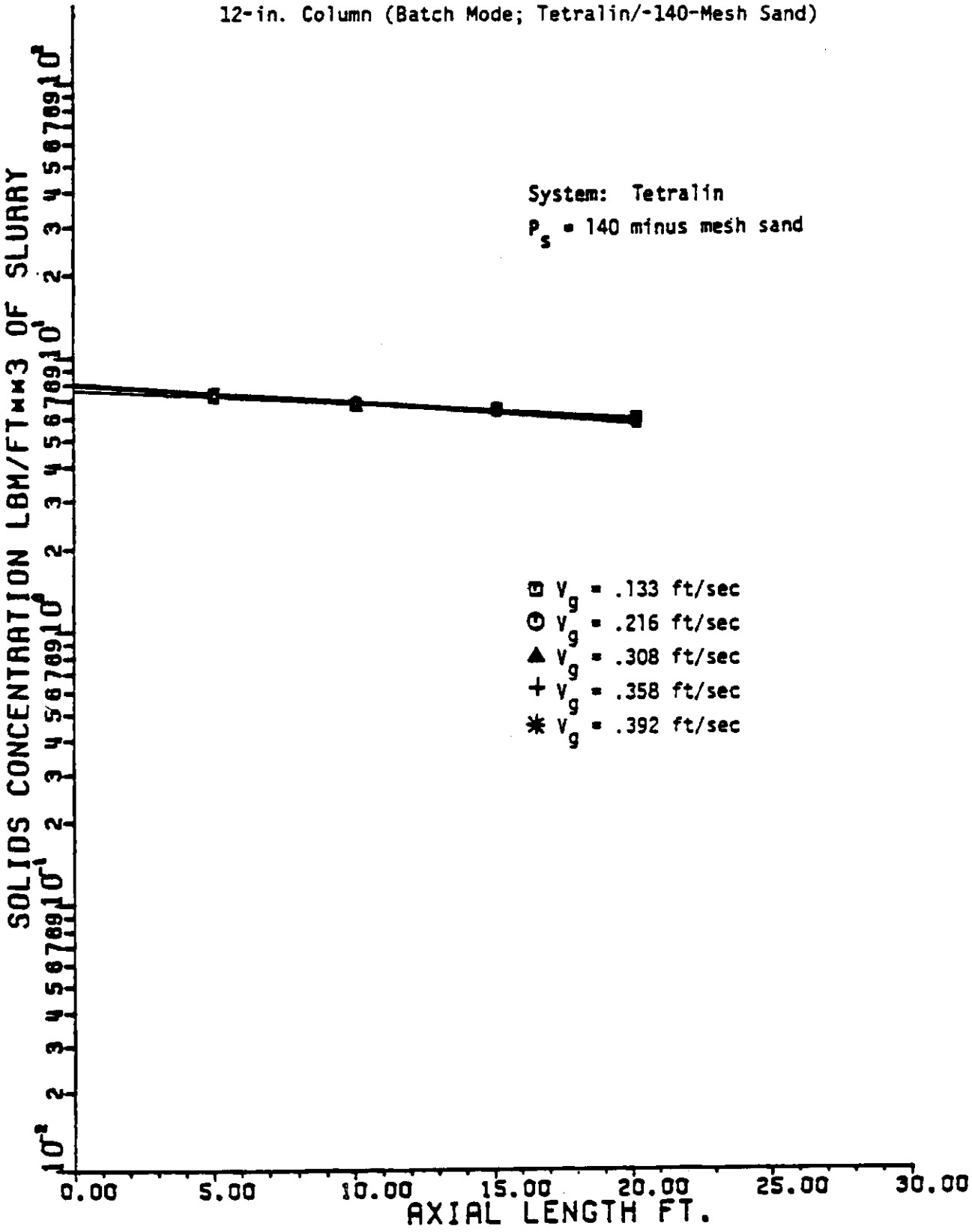


Figure 35

Effect of Gas Velocity on Concentration vs. Length in a 12-in. Column (Batch Mode; Glycol/-140-Mesh Sand)

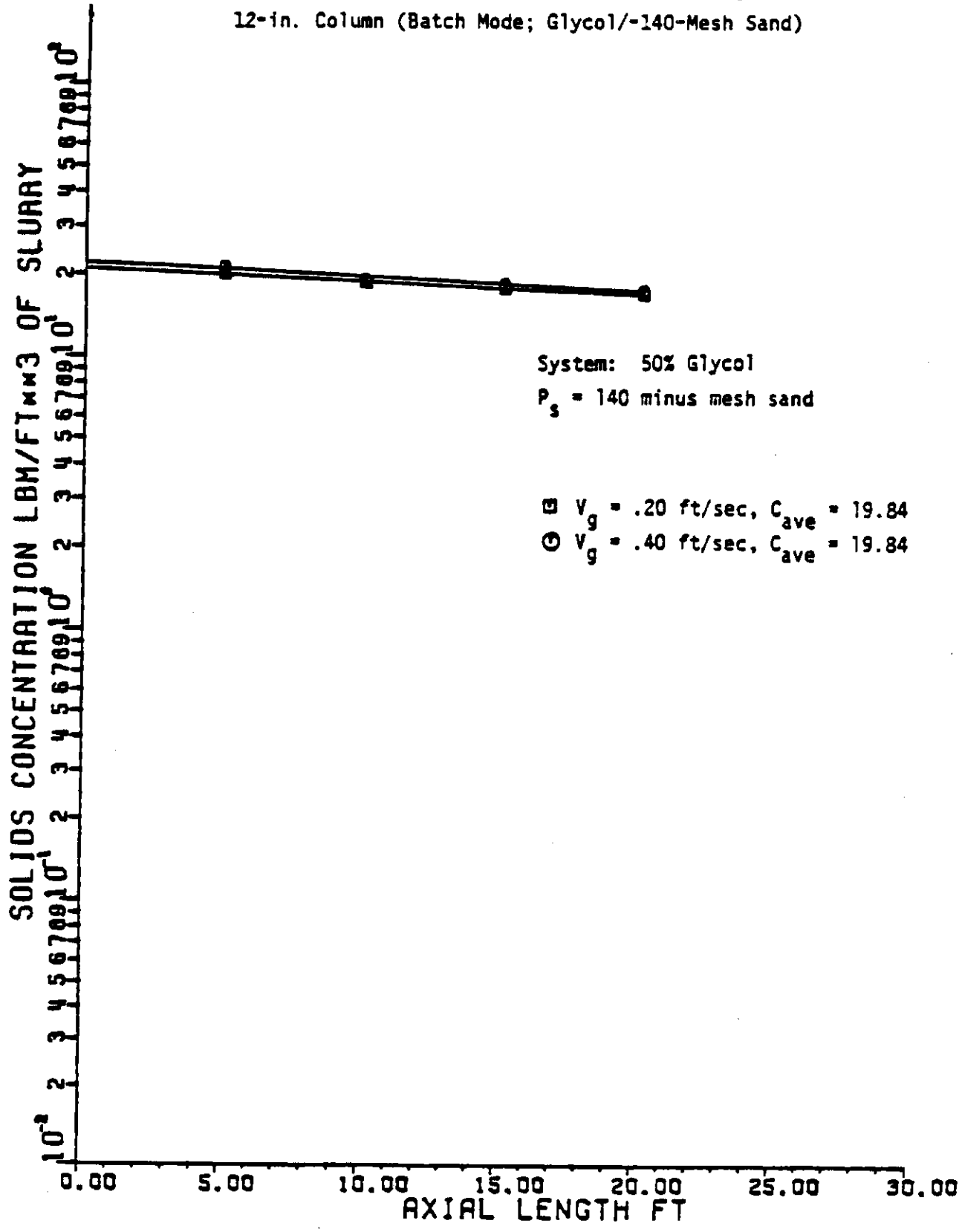


Figure 36

Effect of Gas Velocity on Concentration vs. Length in a 5-in. Column (Batch Mode; Tetralin/60-70-Mesh Glass Beads)

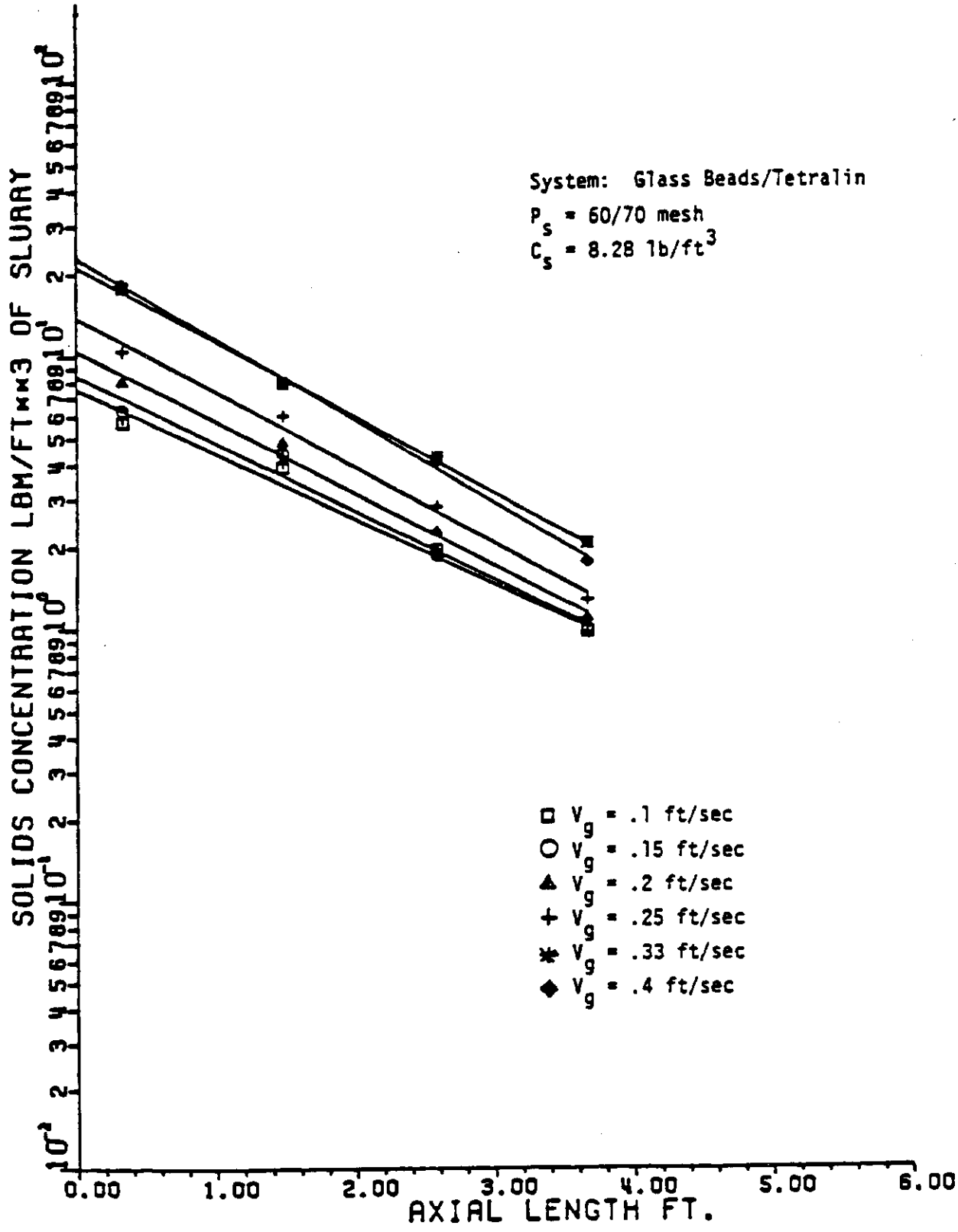


Figure 37

Effect of Gas Velocity on Concentration vs. Length in a 12-in. Column (Batch Mode; Tetralin/60-80-Mesh Sand)

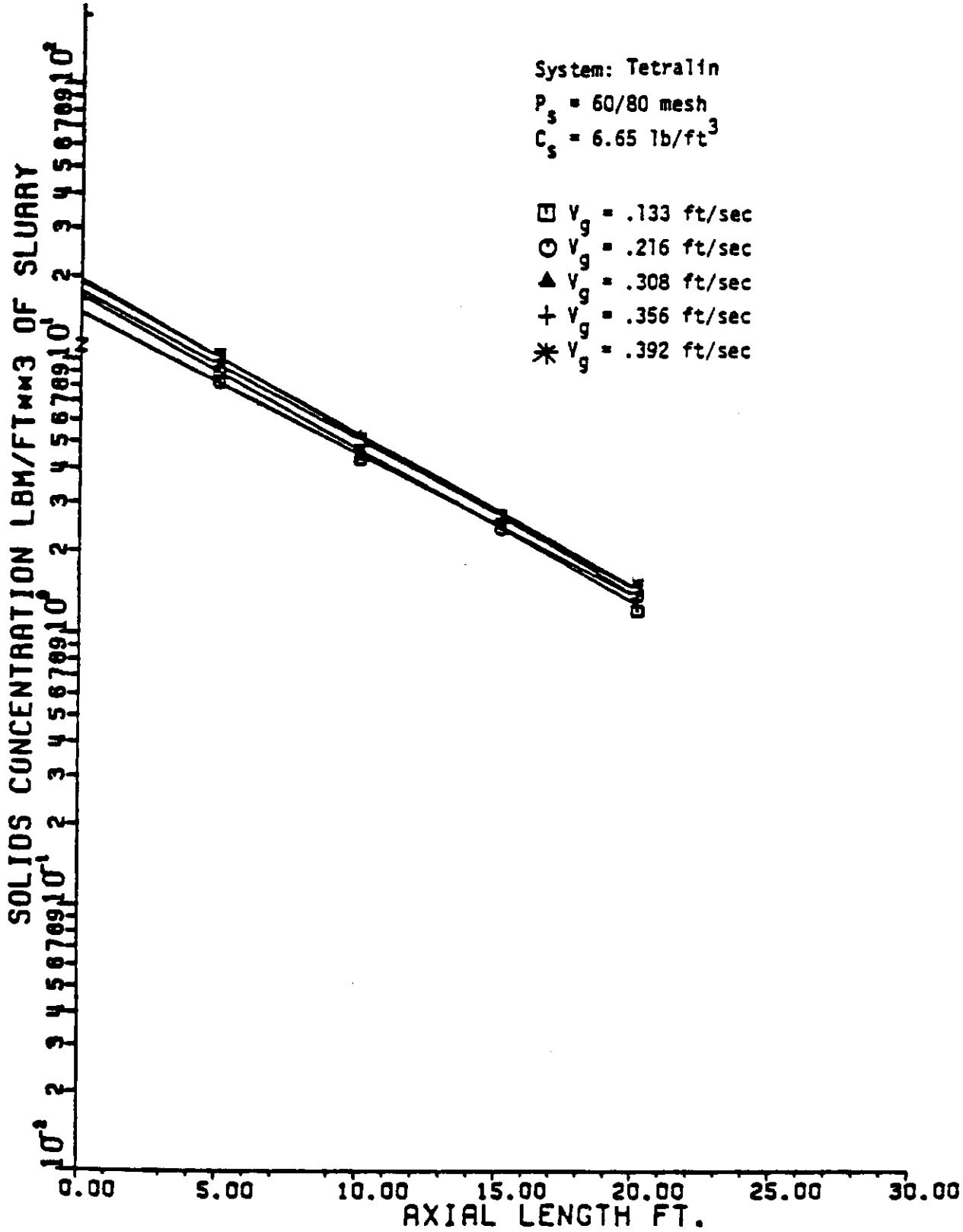


Figure 38

Effect of Gas Velocity on Solids Distribution Concentration vs. Axial Length (Batch Mode; 12-in. Column; Glycol/60-80-Mesh Sand)

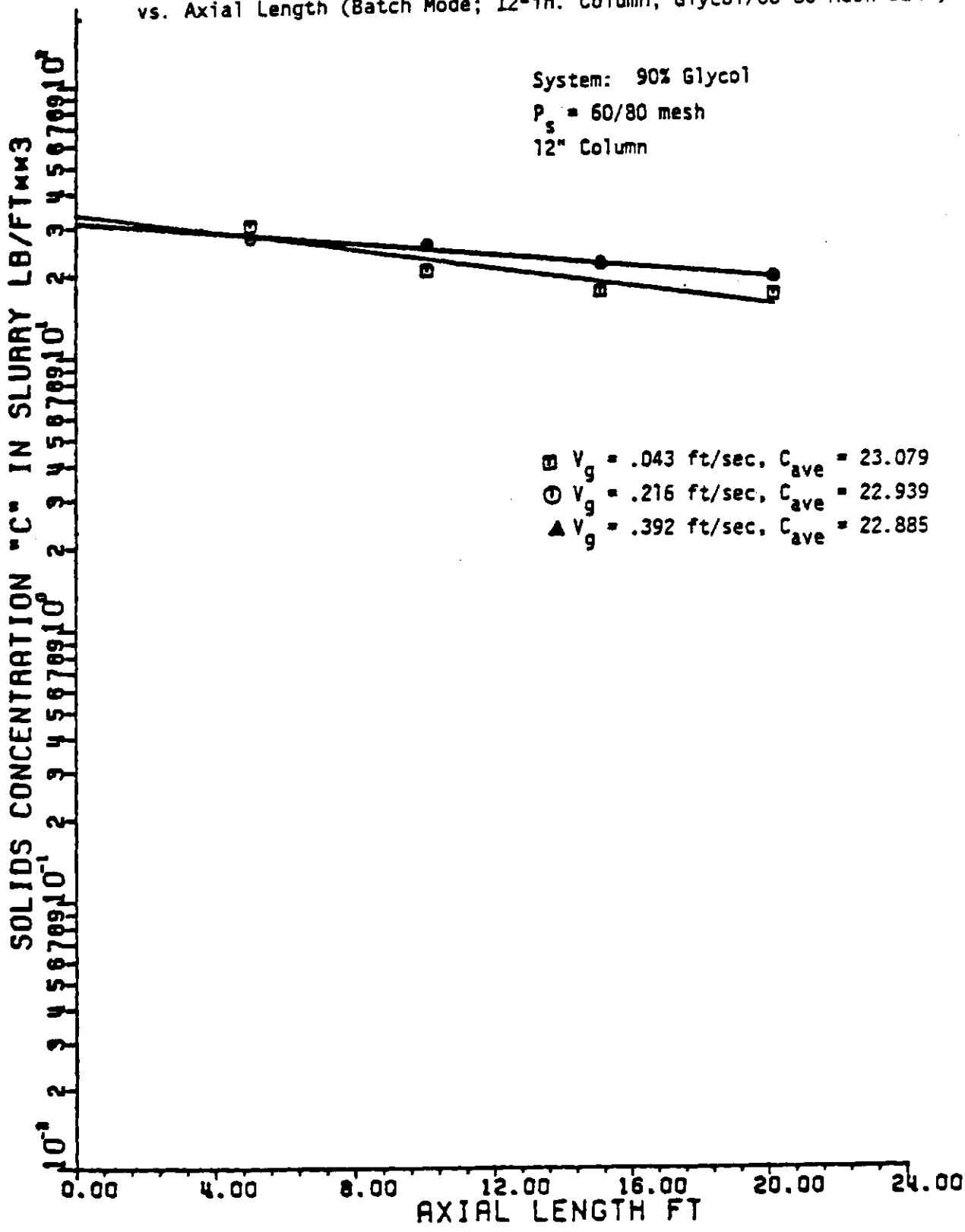


Figure 39

Effect of Gas Velocity on Concentration vs. Length in a 12-in. Column (Continuous Mode; Tetralin/-140-Mesh Sand)

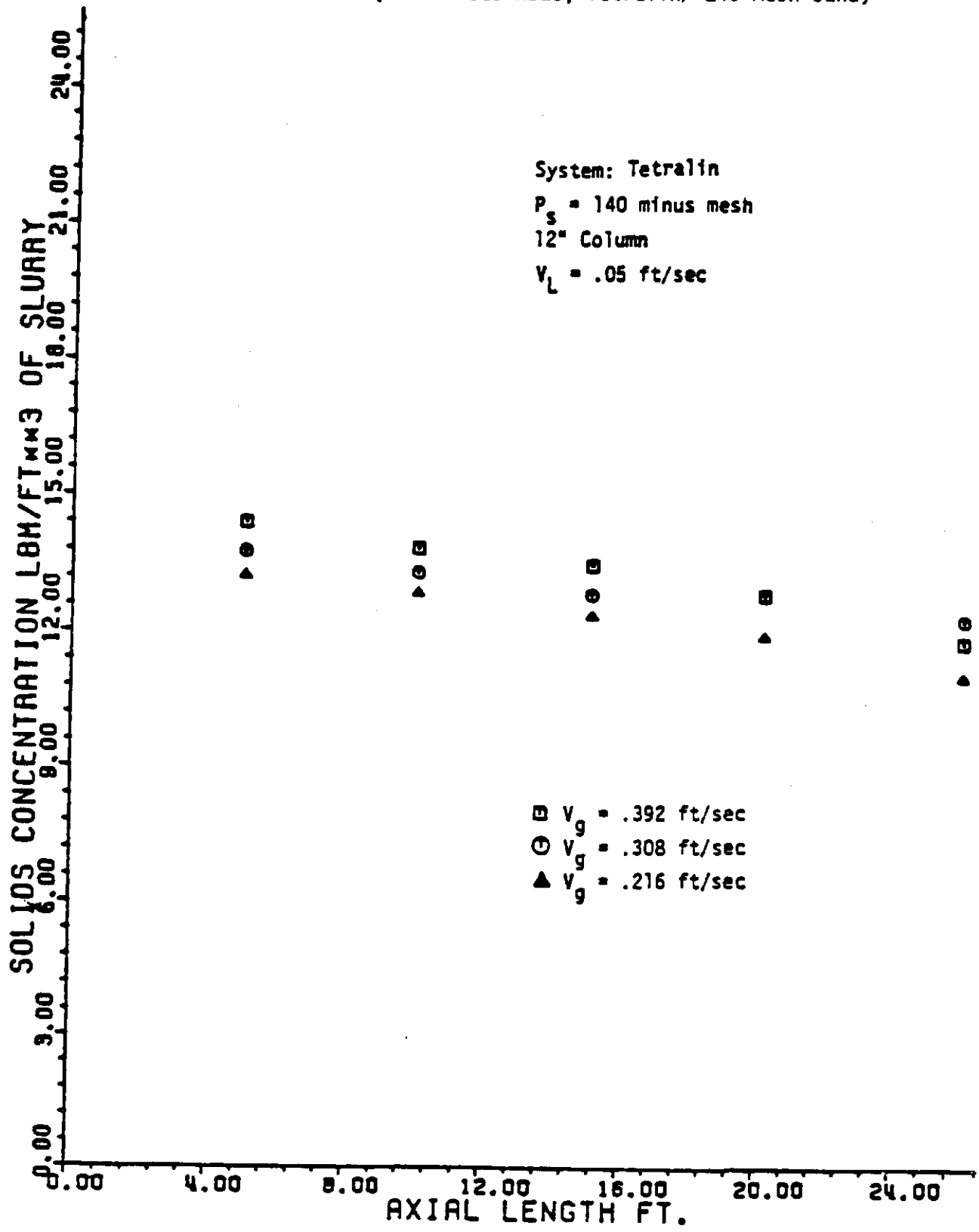


Figure 40

Effect of Gas Velocity on Solids Distribution Profile in the 12-in. Column (Continuous Mode; Glycol/-140-Mesh Sand)

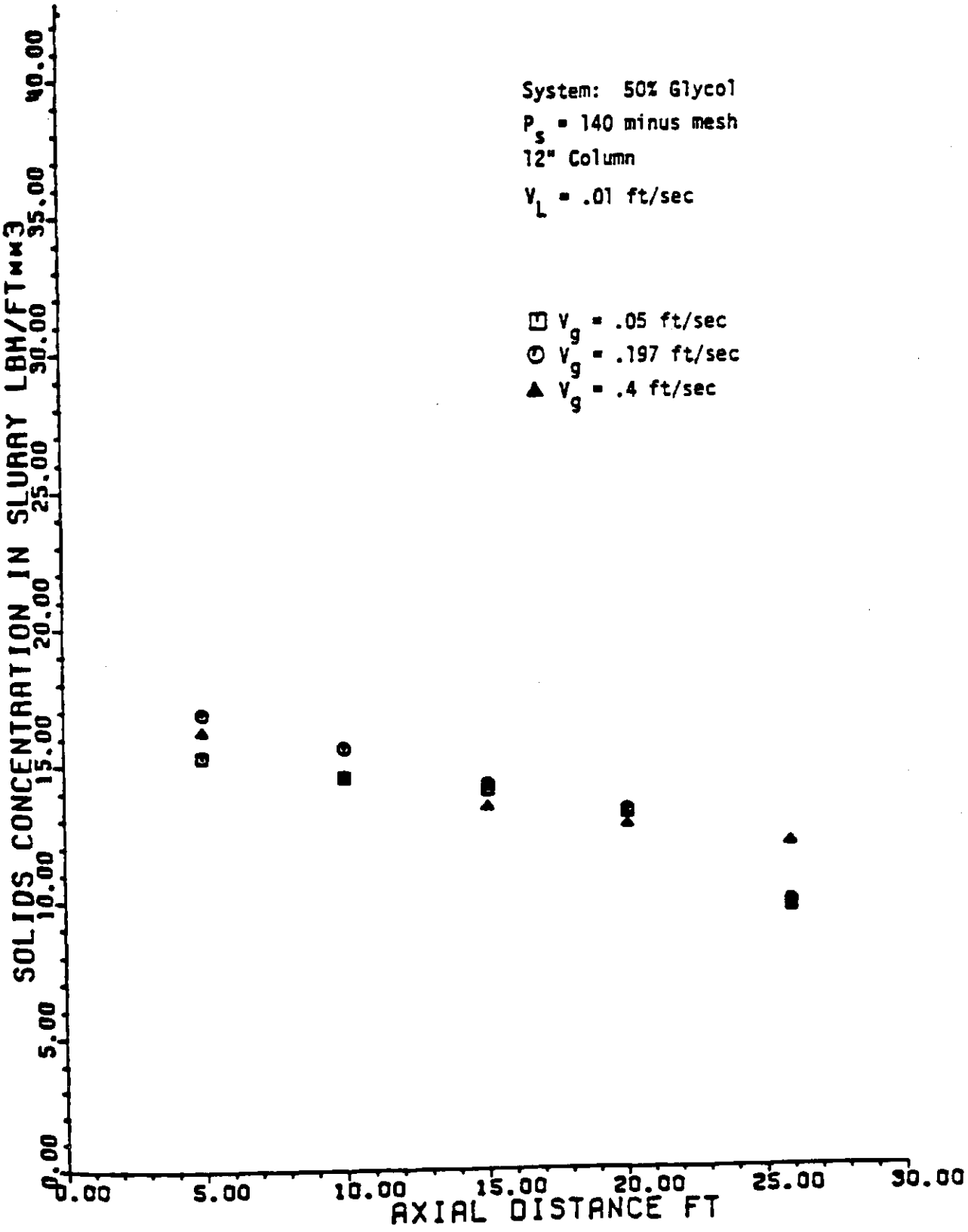


Figure 41
Effect of Gas Velocity on the Distribution of
Large Particles (12-in. Column)
(Continuous Mode; 60/80-Mesh Sand)

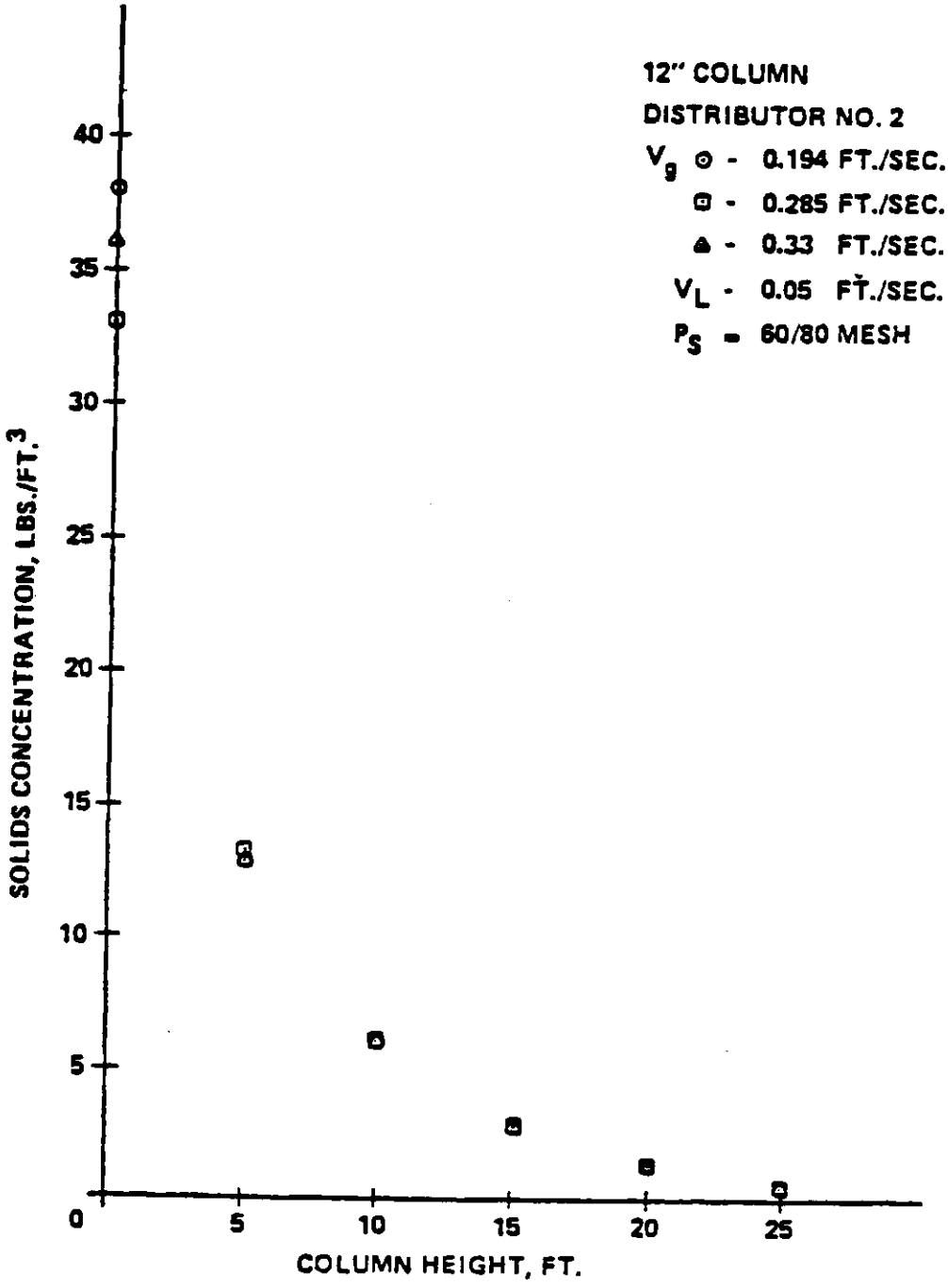


Figure 42

Effect of Gas Velocity on Concentration vs. Length in the 12-in. Column (Continuous Mode; Tetralin/60-80-Mesh Sand)

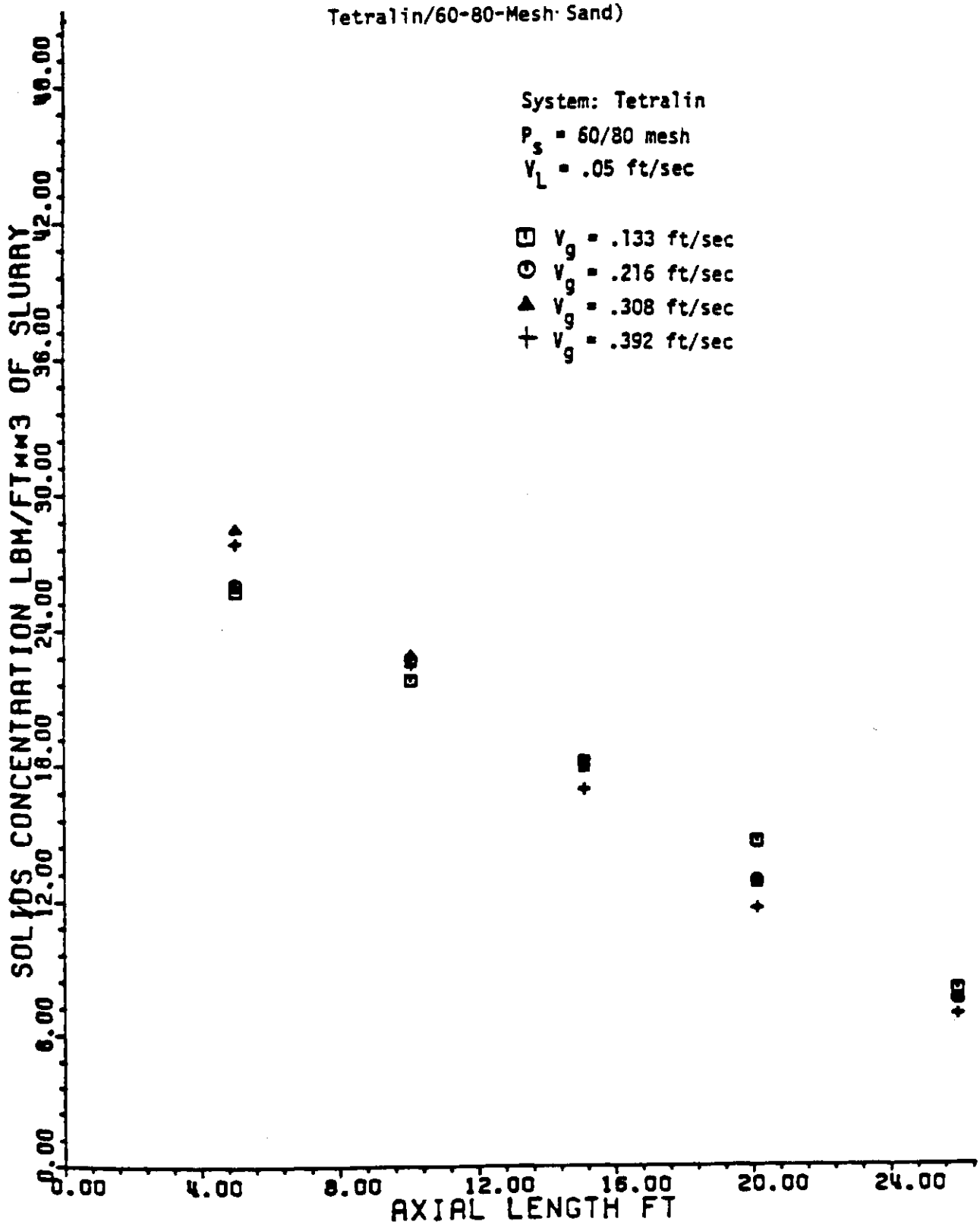


Figure 43
Effect of Gas Velocity on Average Solids Distribution
(12-in. Column; Continuous Mode;
Tetralin/-140- and 60-80-Mesh Sand)

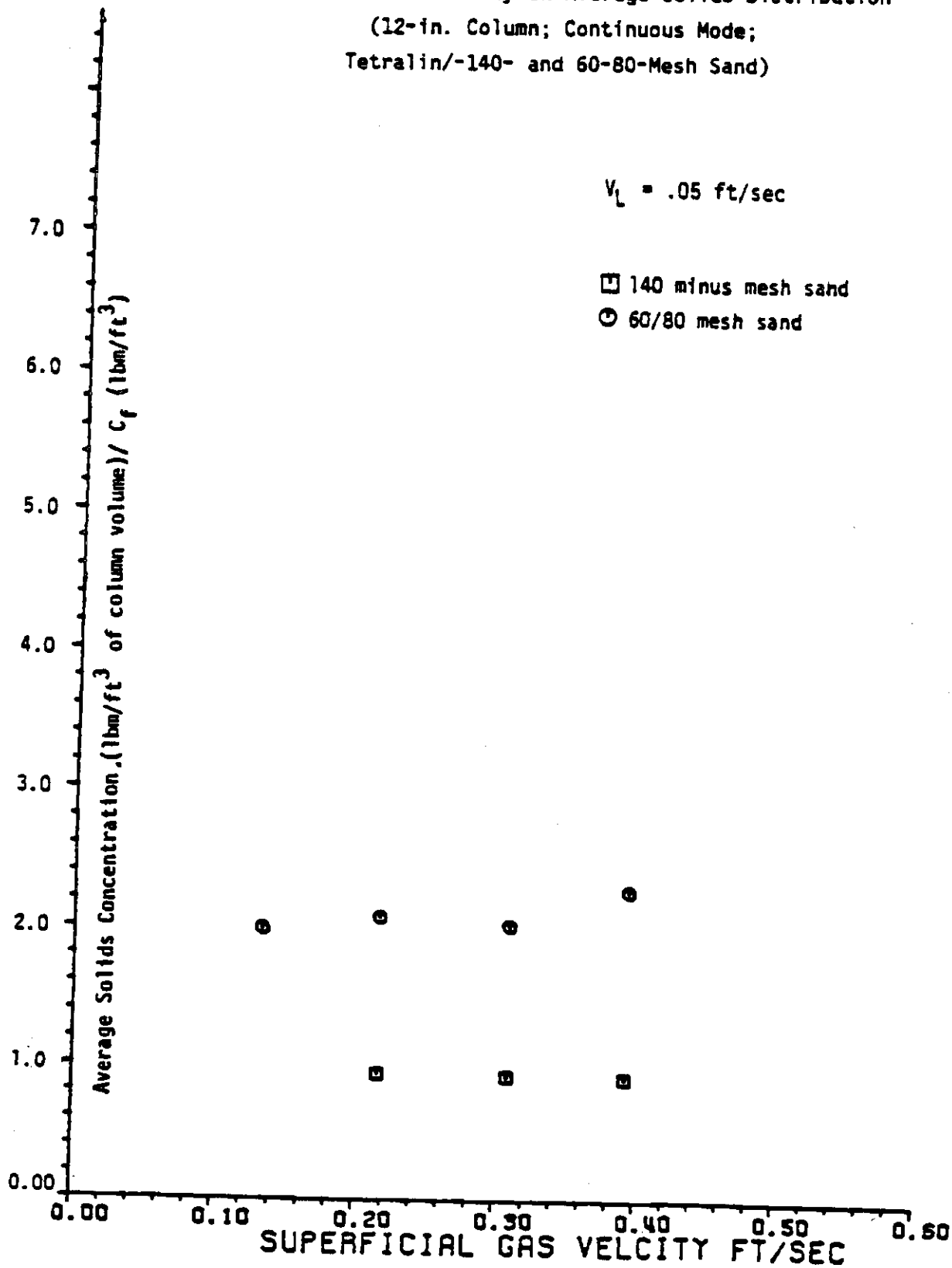


Figure 44

Effect of Gas Velocity on Solids Distribution

(6-ft Column; 100-200-Mesh Sand; Continuous Mode)

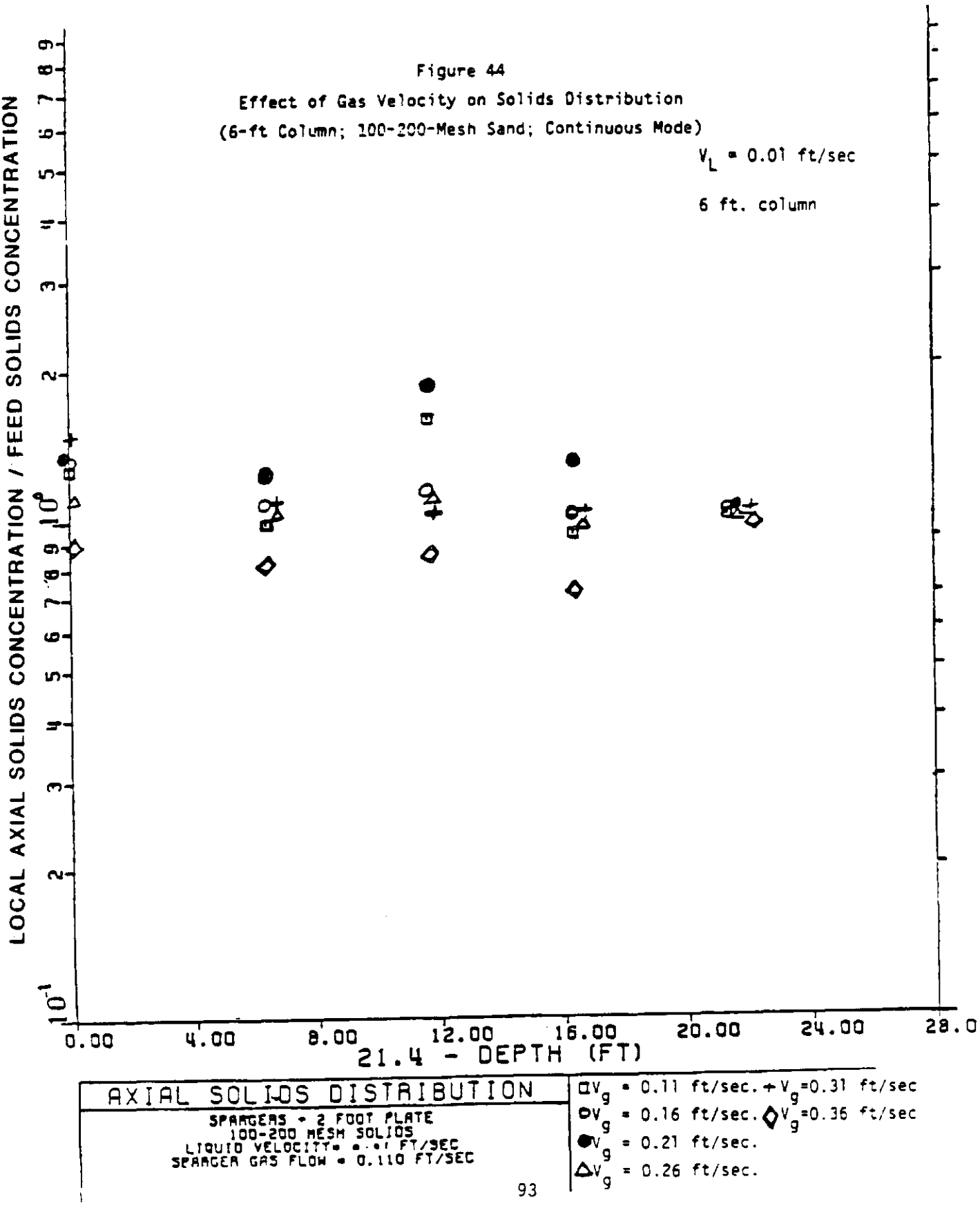


Figure 45

Effect of Gas Velocity on Solids Distribution (6-ft Column; 100-200- and 30-50-Mesh Sand; Continuous Mode)

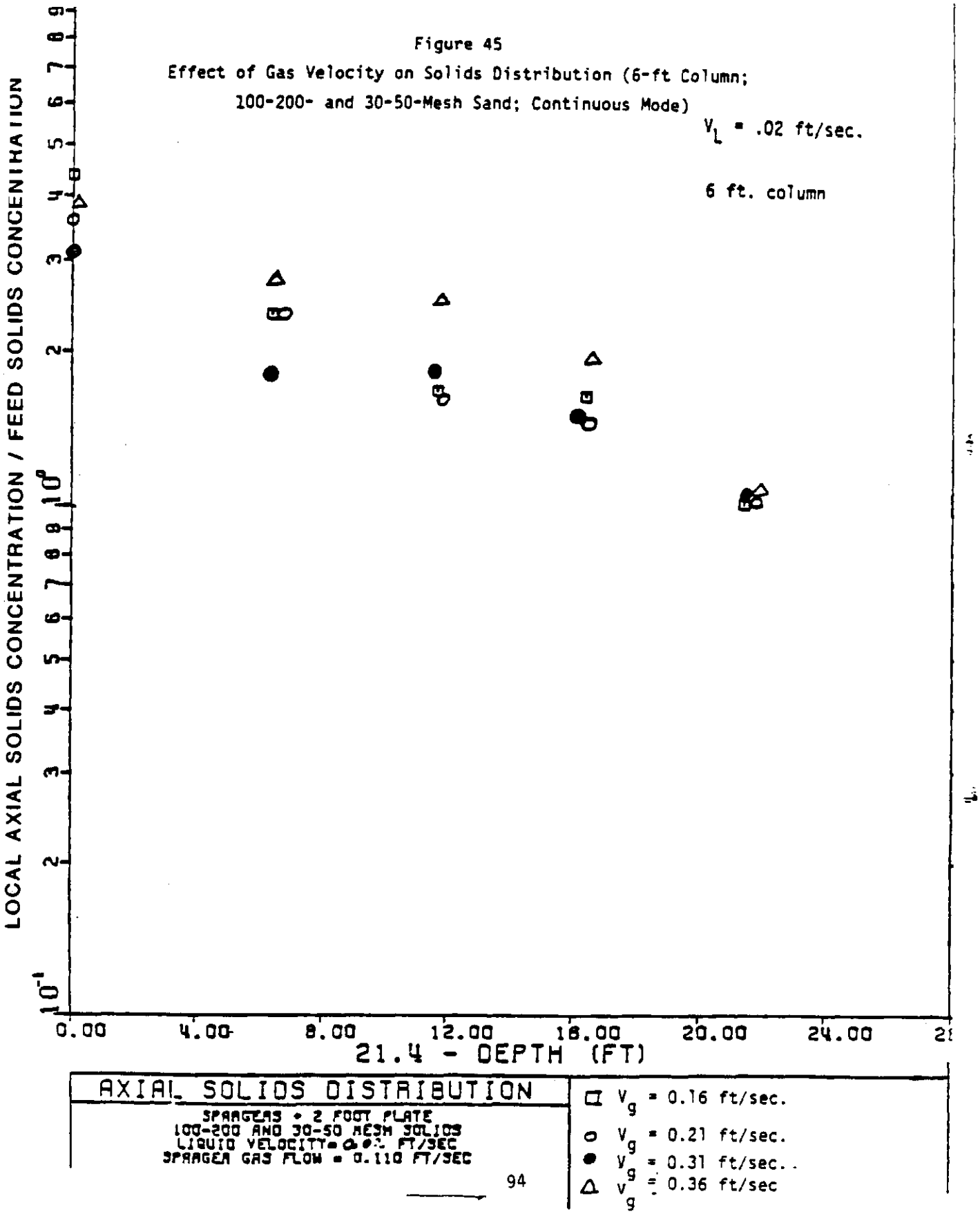


Figure 46
Effect of Liquid Velocity on Solids Distribution
(5-in. Column; Continuous Mode)

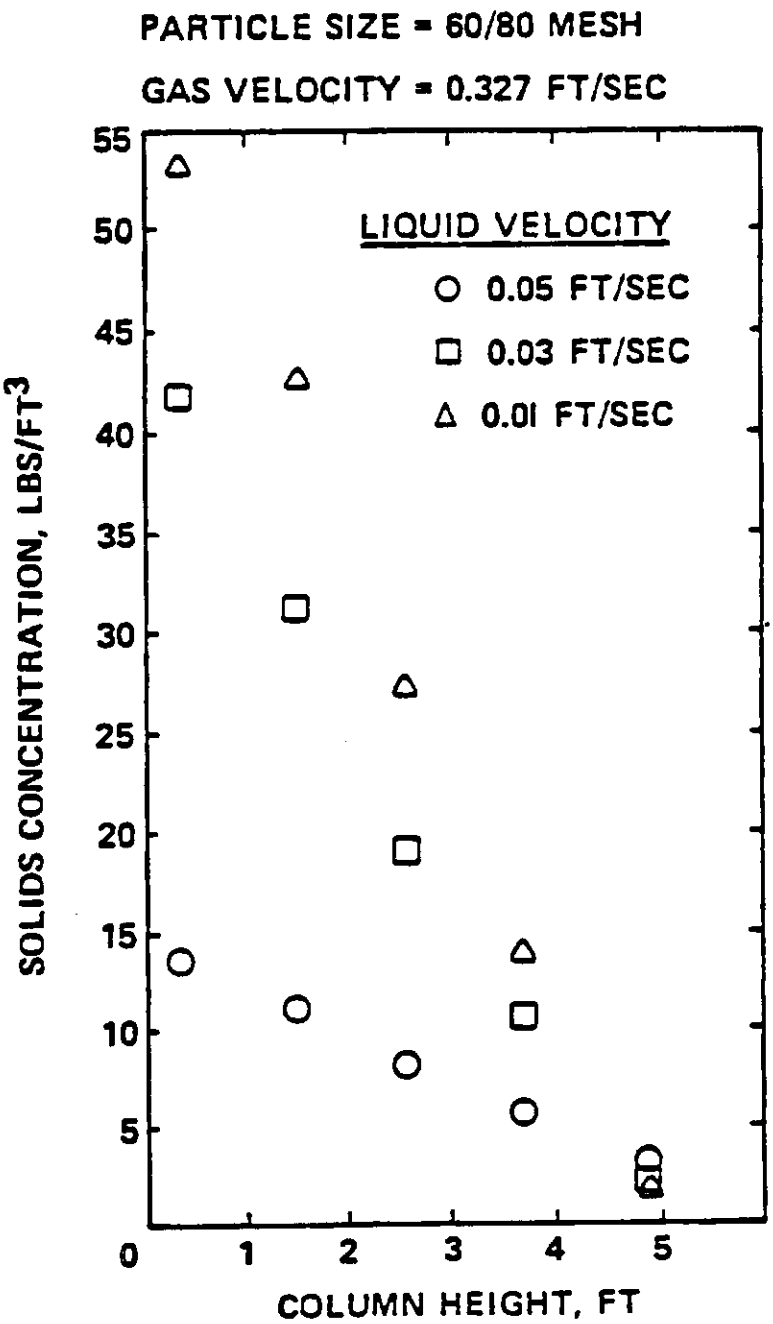


Figure 47
Effect of Liquid Velocity on Axial Solids Distribution
(12-in. Column; Continuous Mode)

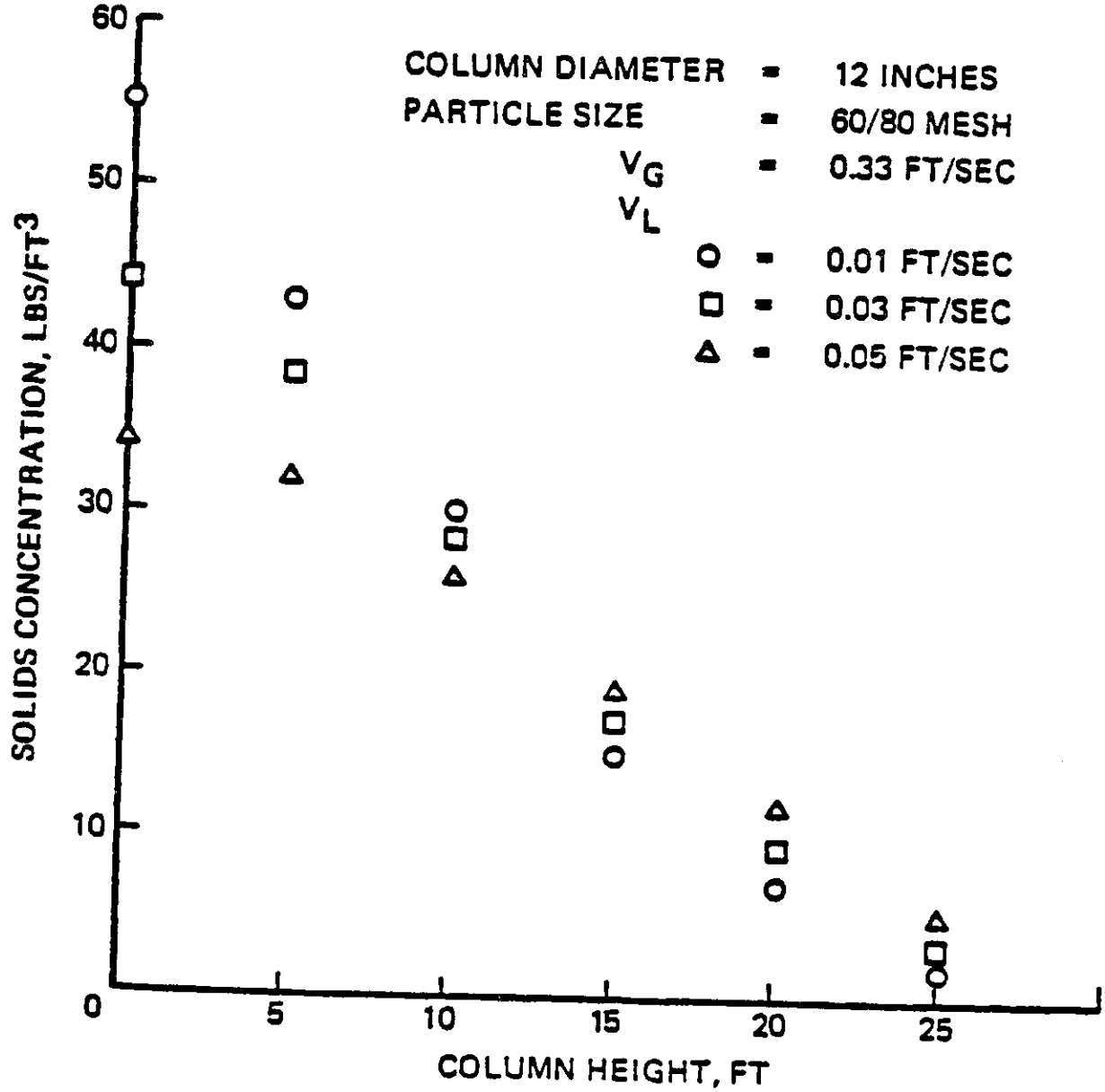


Figure 48

Effect of Liquid Velocity on the Distribution of Fine Particles (12-in. Column; Air/Water/Sand; Continuous Mode)

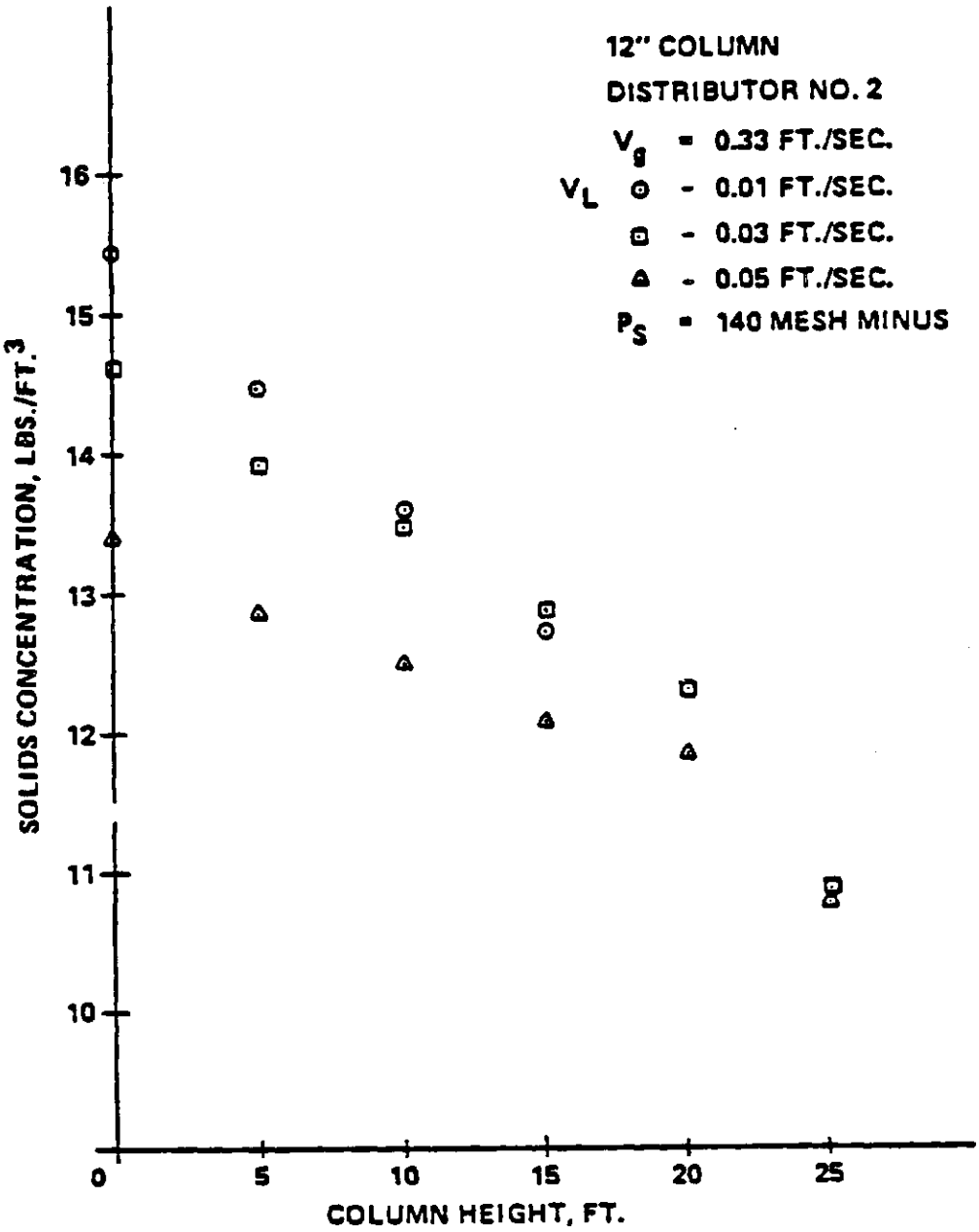


Figure 49

Effect of Liquid Velocity on Axial Solids Distribution

(6-ft Column with Internals; 100-200-Mesh; Continuous Mode)

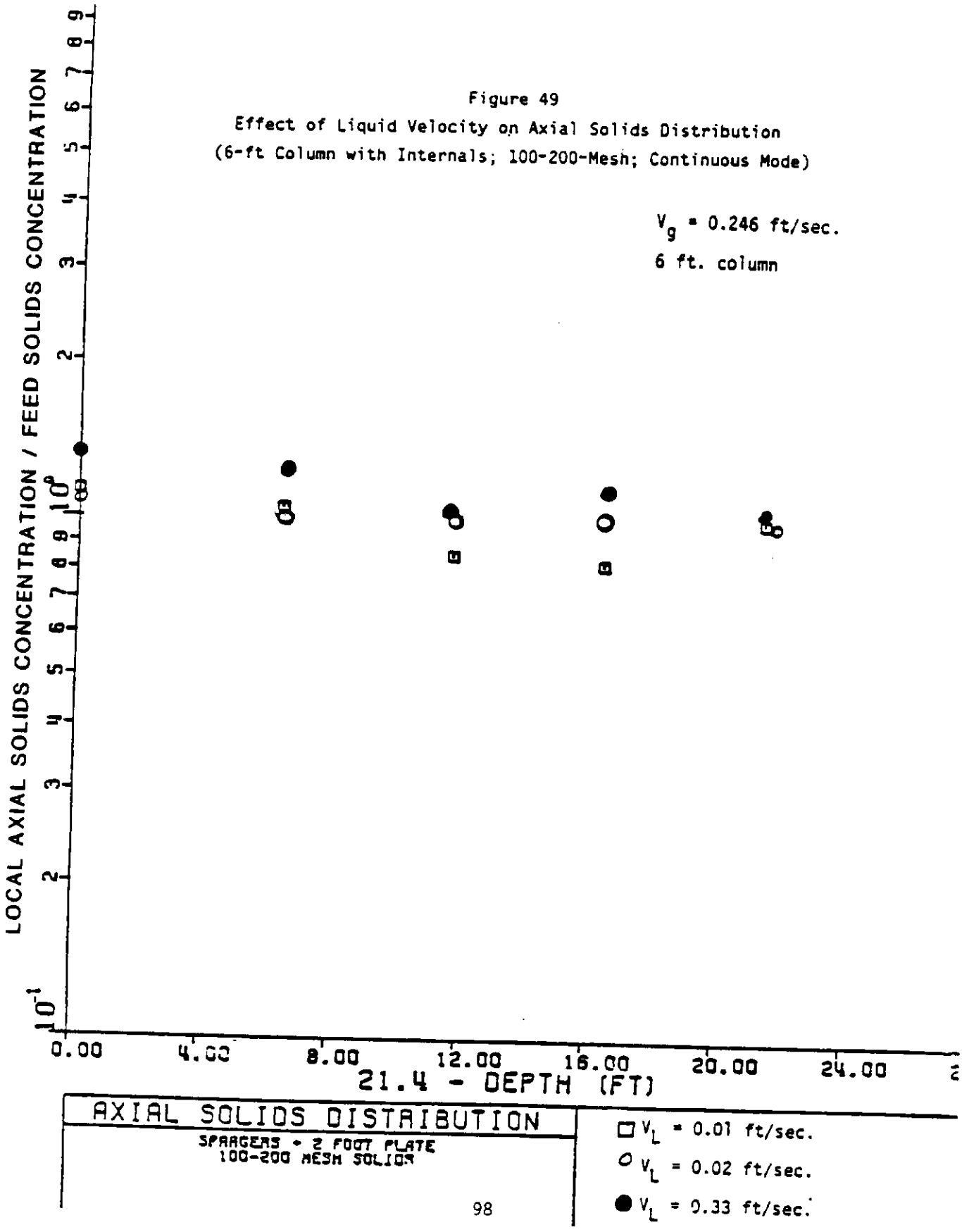


Figure 50

Effect of Liquid Velocity on Axial Solids Distribution

(6-ft Column with Internals; 100-200- and 30-50-Mesh; Continuous Mode)

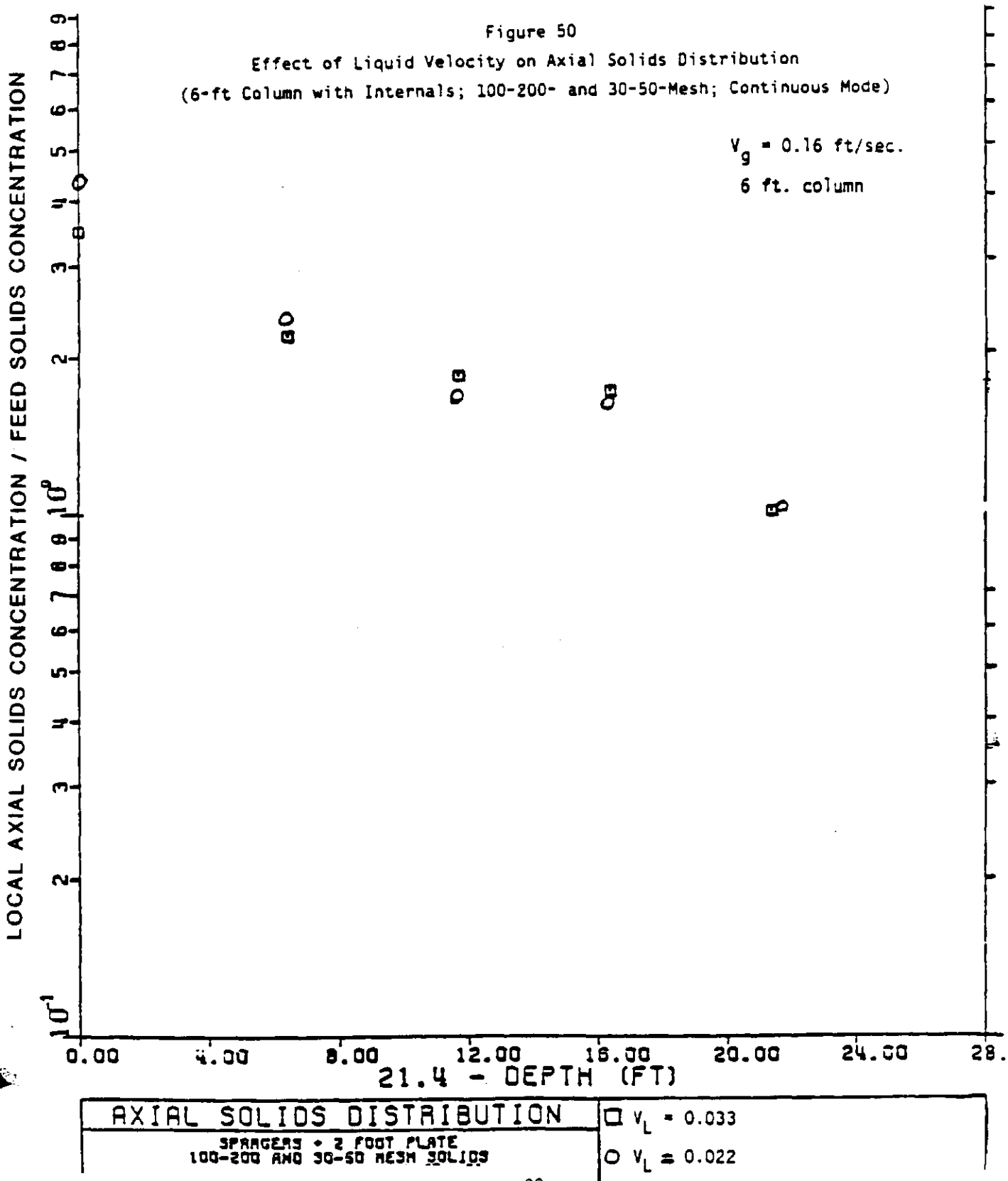


Figure 51

Effect of Liquid Velocity on Solids Accumulation

(12-in. Column; Tetralin/60-80- Mesh Sand; Continuous Mode)

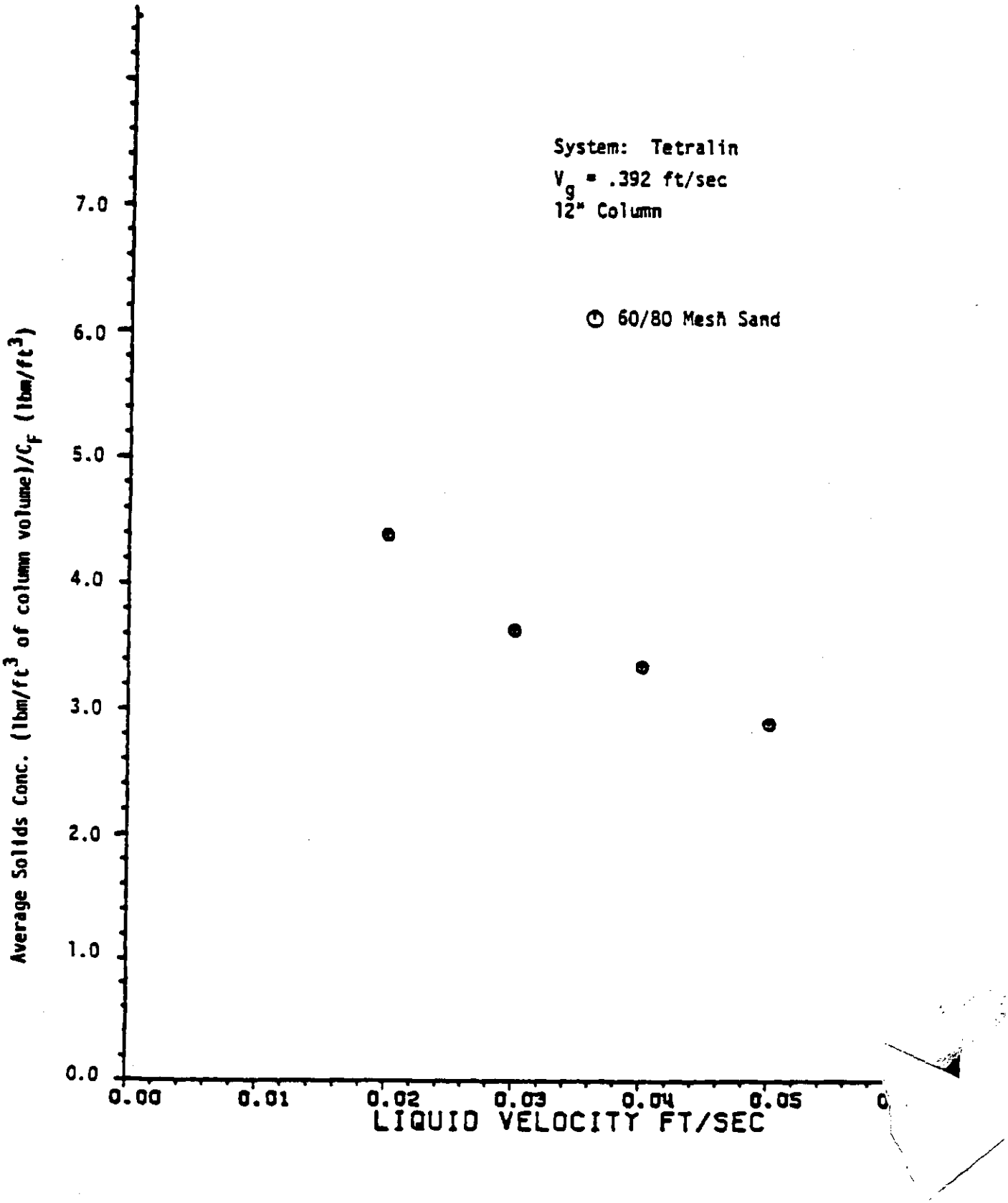


Figure 52
Effect of Viscosity on Solids Distribution
(12-in. Column; Continuous Mode)

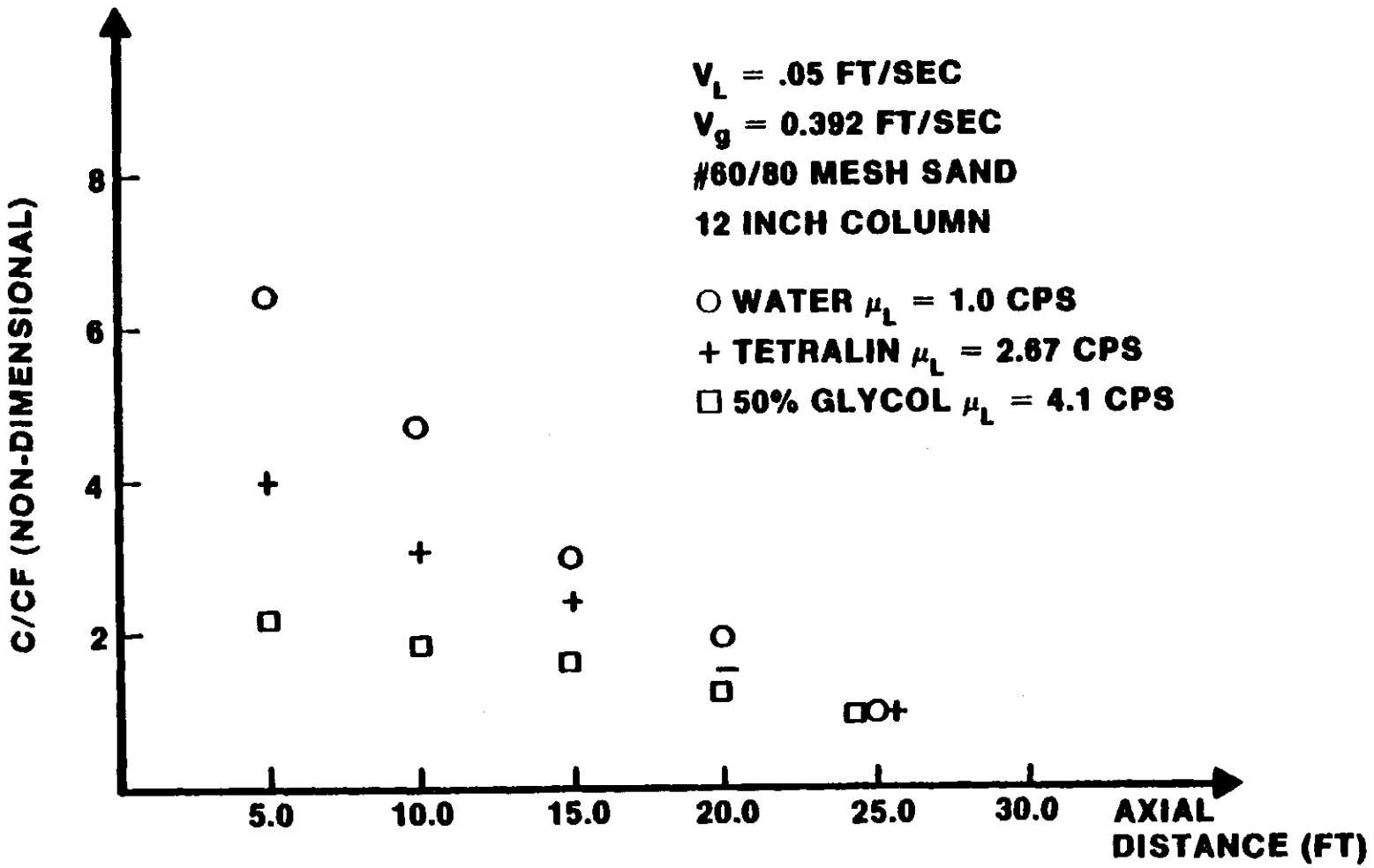


Figure 53
Effect of Particle Size on Solids Distribution
(5-in. Column; Continuous Mode)

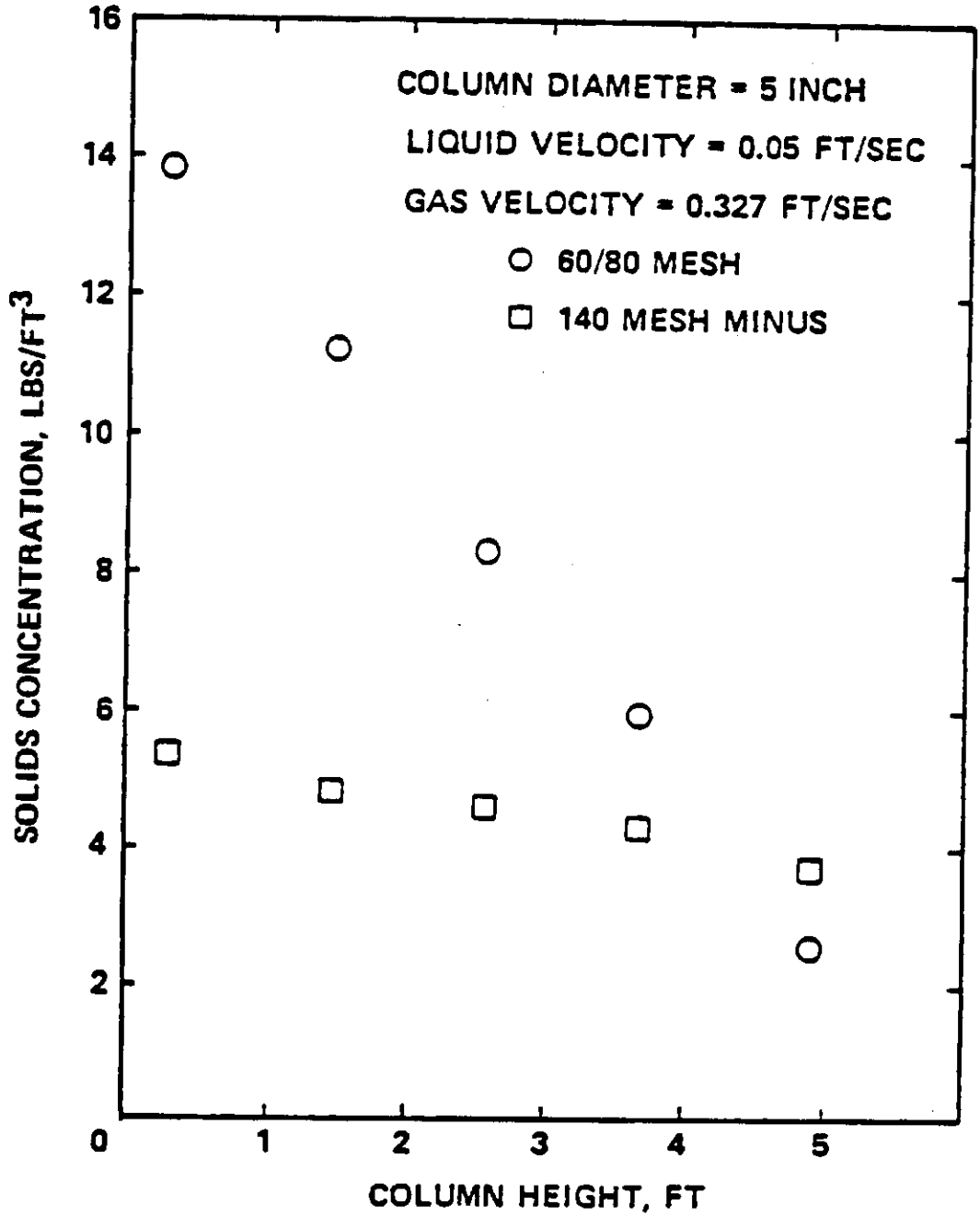


Figure 54
Effect of Particle Size on Solids Distribution
(12-in. Column; Continuous Mode)

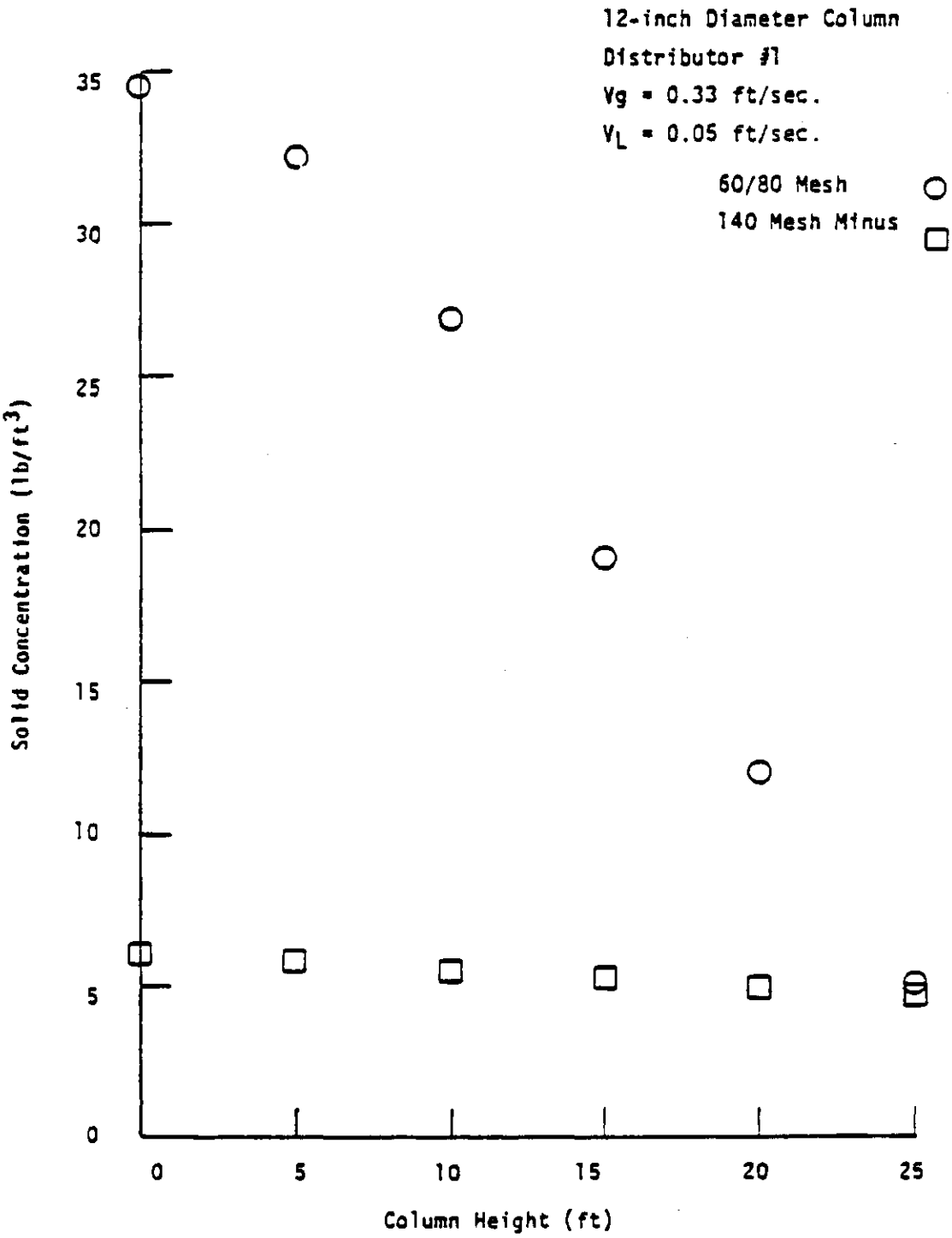


Figure 55
Effect of Particle Size on Solids Distribution
(6-ft Column; Continuous Mode)

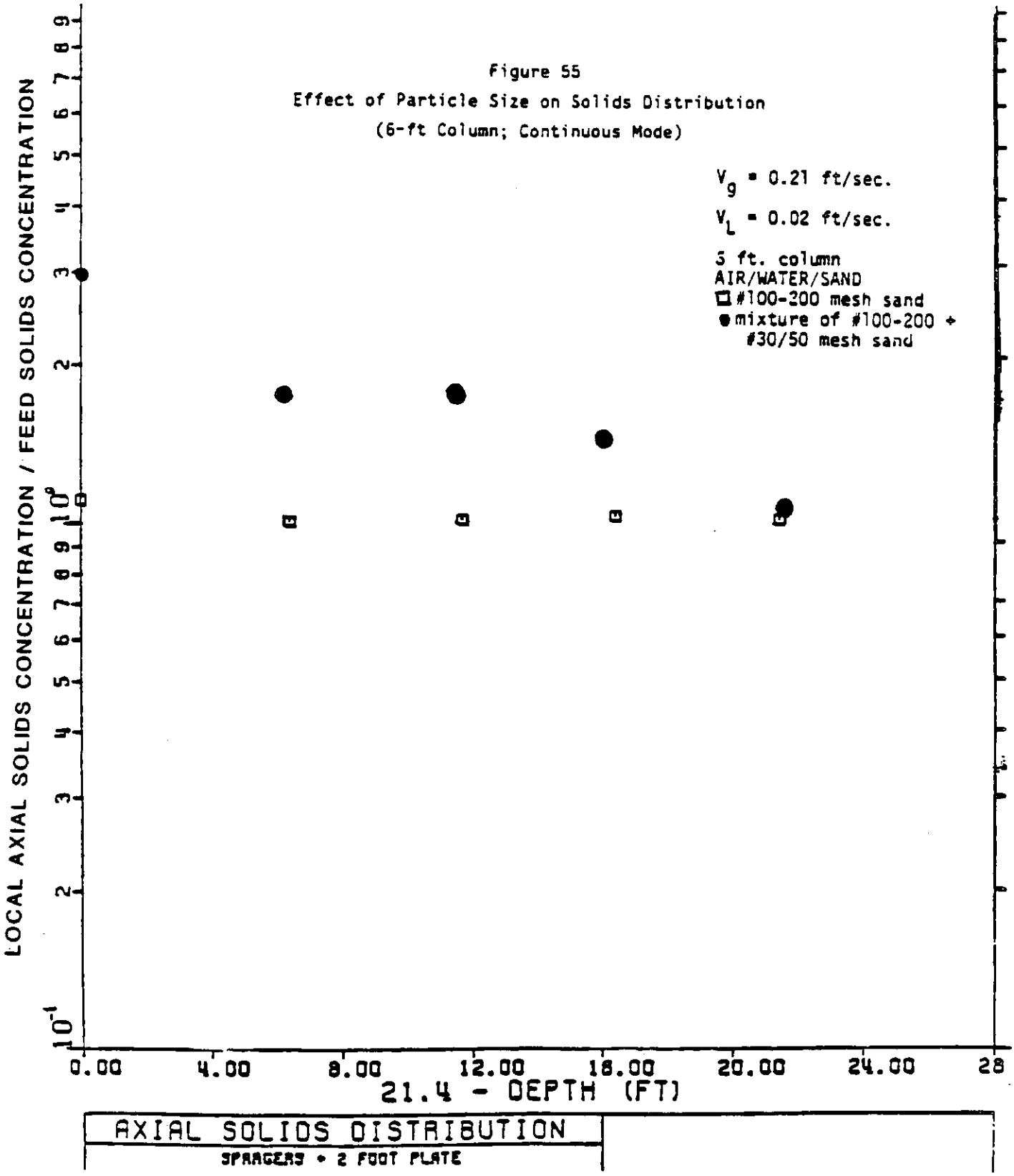


Figure 56

Effect of Distributors on Normalized Solids Distribution

(12-in. Column; -140-Mesh Sand; Continuous Mode)

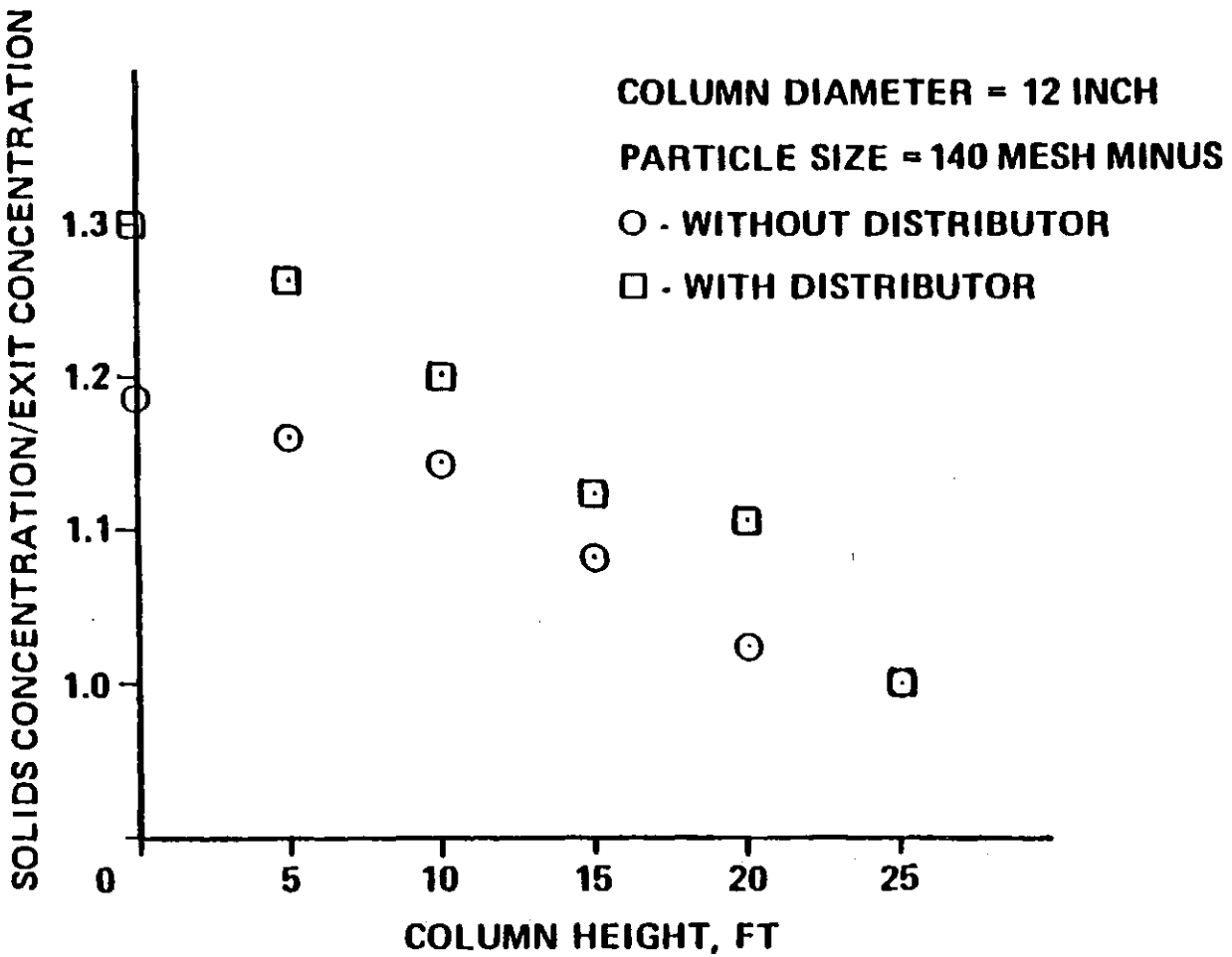


Figure 57

Effect of Distributors on Nondimensionalized Solids Distribution

(12-in. Column; 60-80-Mesh Sand; Continuous Mode)

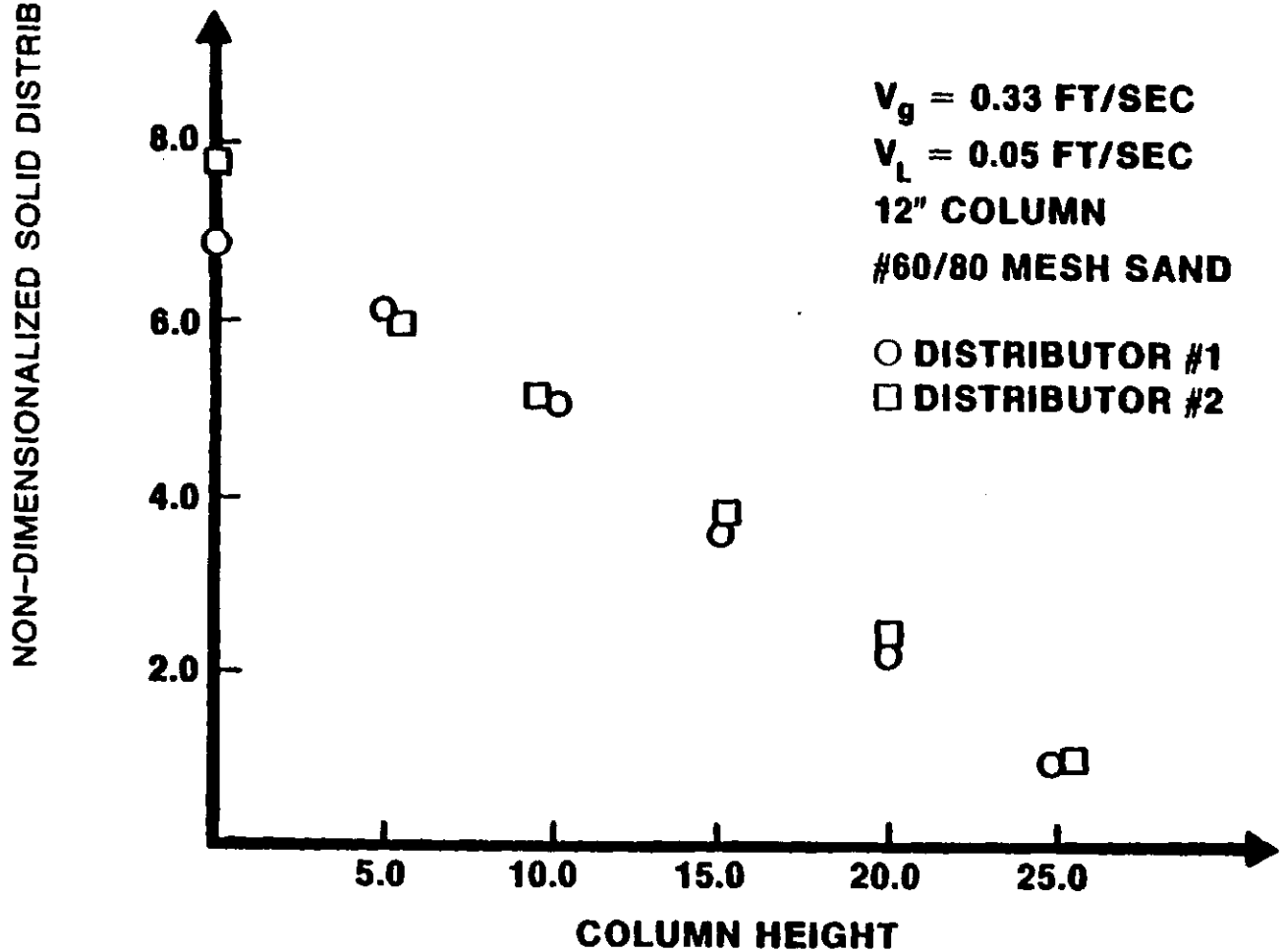


Figure 58

Effect of Column Diameter on Nondimensionalized Solids Distribution

(60/80- and -140-Mesh Sand; Continuous Mode)

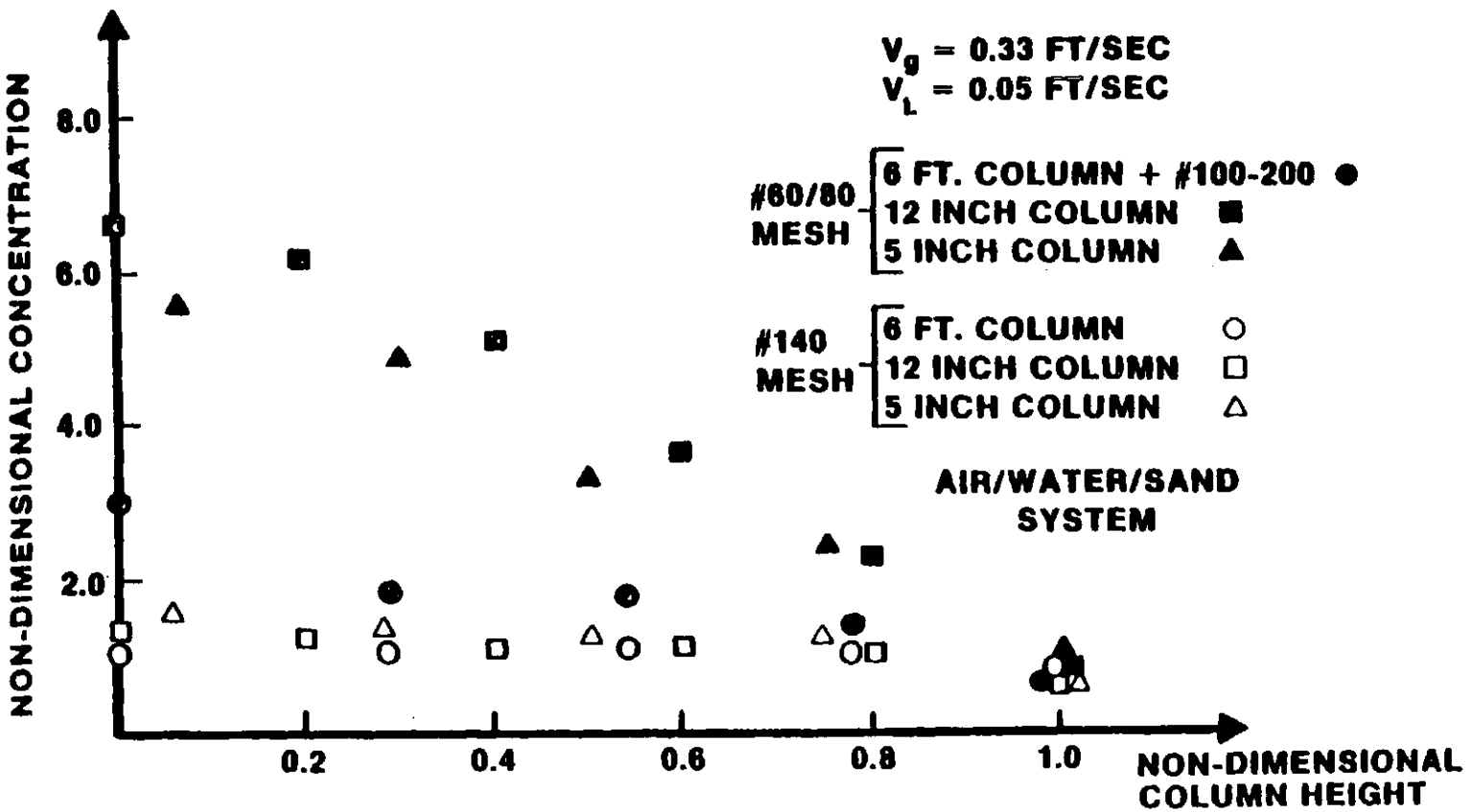


Figure 59

Effect of Column Diameter on Solids Concentration

(No Distributor; Continuous Mode; 5- and 12-in. Columns)

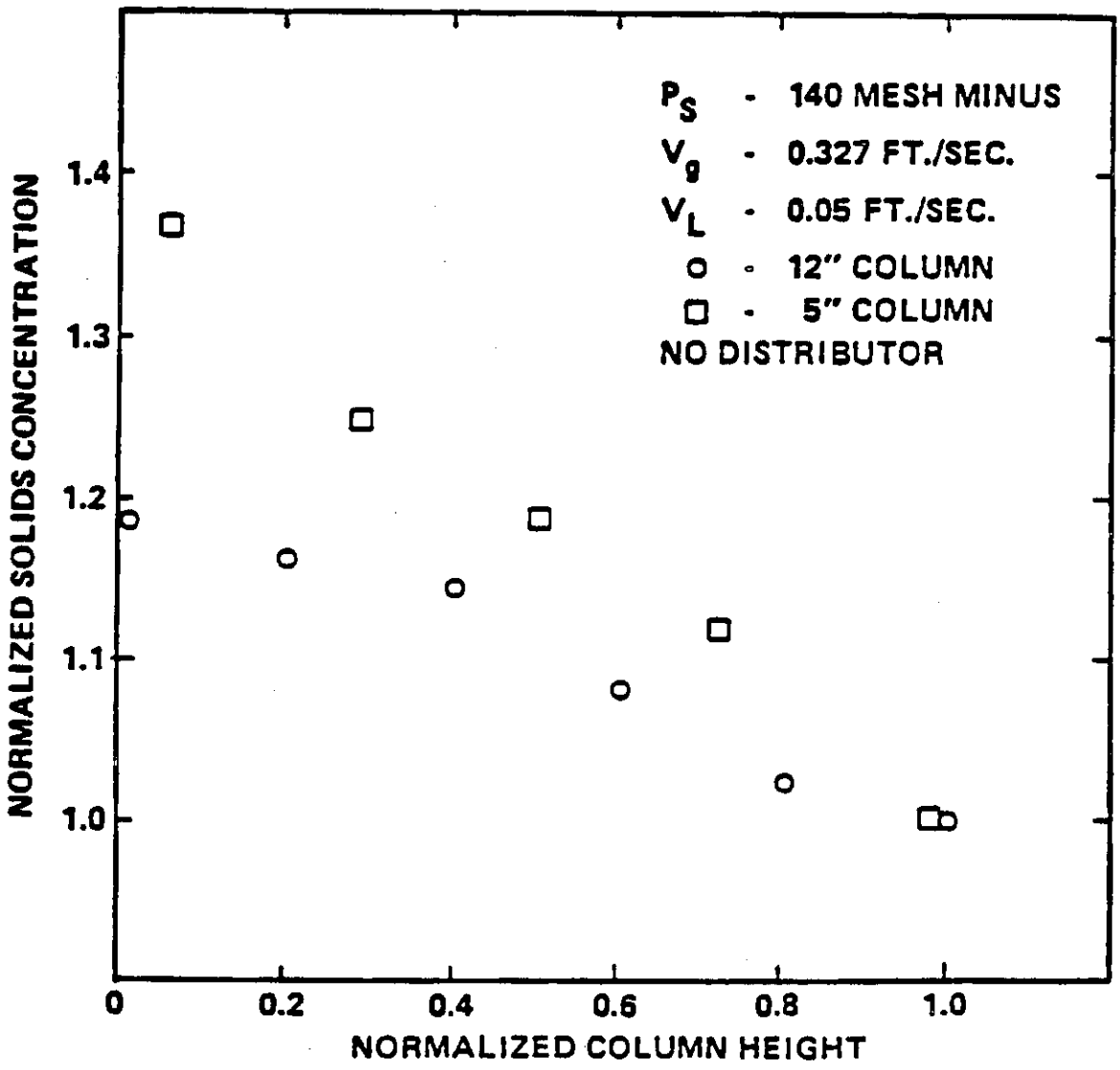


Figure 60

Effect of Column Diameter on Solids Concentration

(Distributor #1; Continuous Mode; 5- and 12-in. Columns)

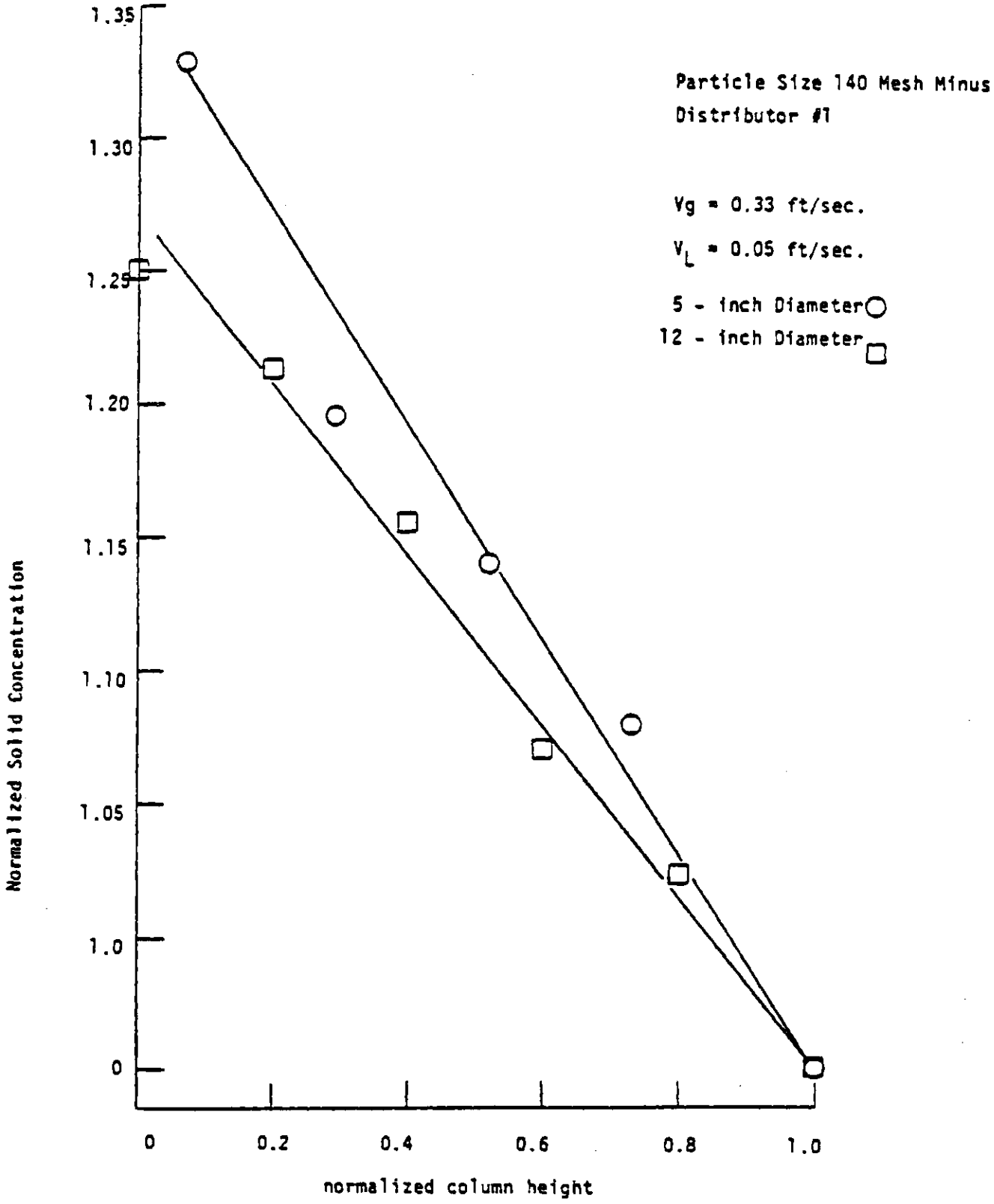


Figure 61

Slurry Concentration vs. Axial Length:

Comparison with Model's Predictions (Water/Sand; Continuous Mode)

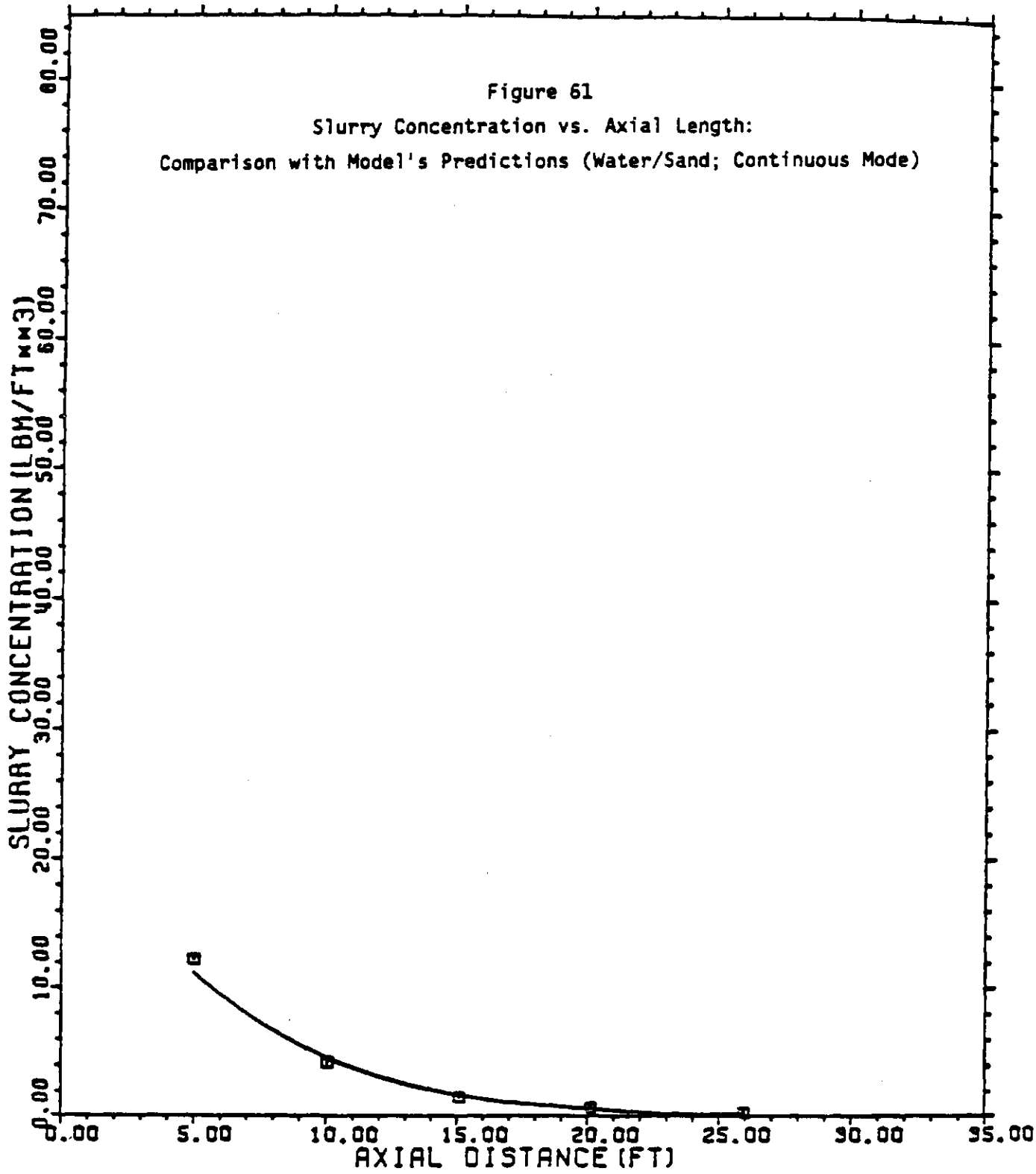


Figure 62

Slurry Concentration vs. Axial Length: Comparison with Model's Predictions (Tetralin/Sand; Continuous Mode)

12 inch column

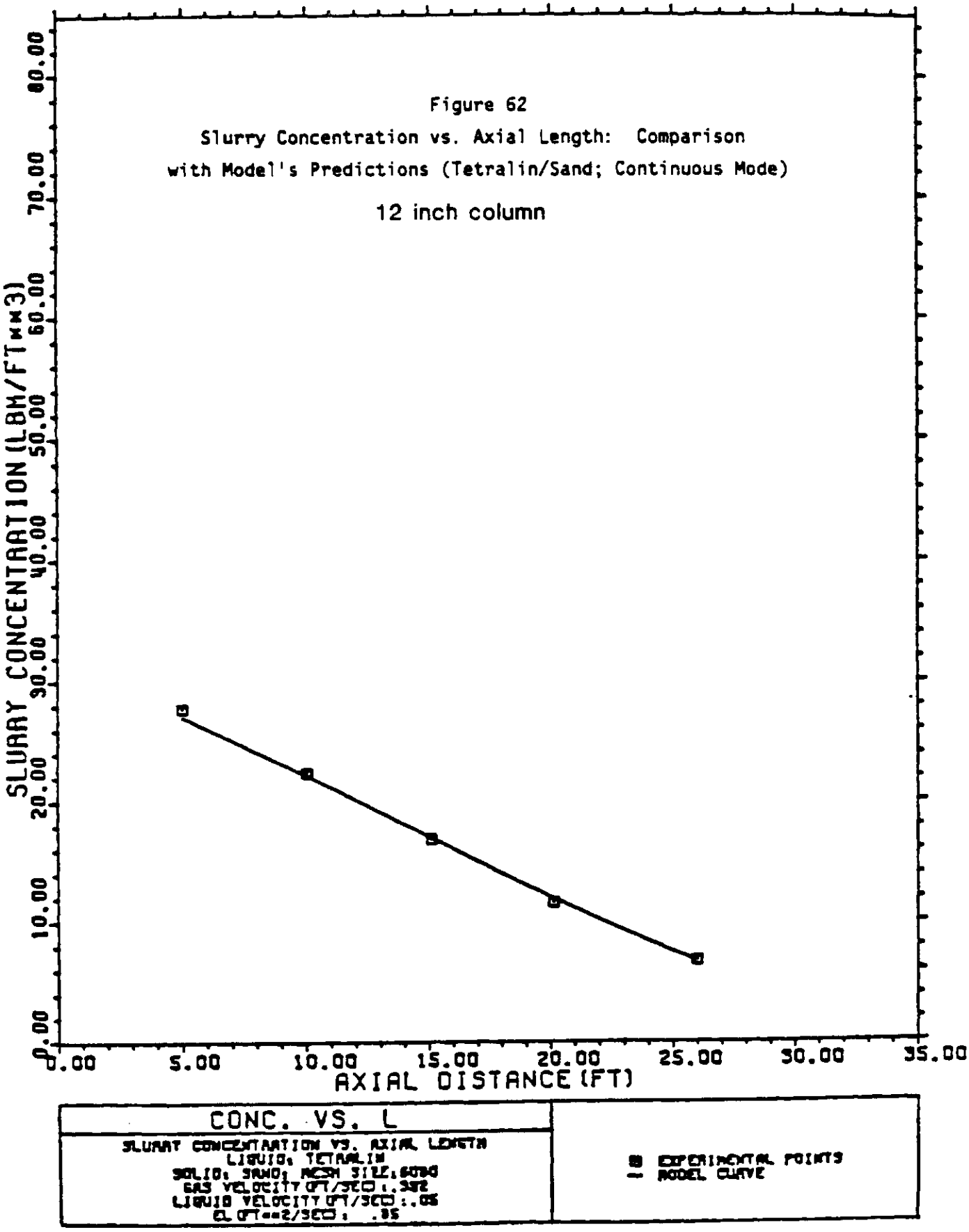


Figure 63

Slurry Concentration vs. Axial Length: Comparison with Model's Predictions (50% Glycol/Sand; Continuous Mode)

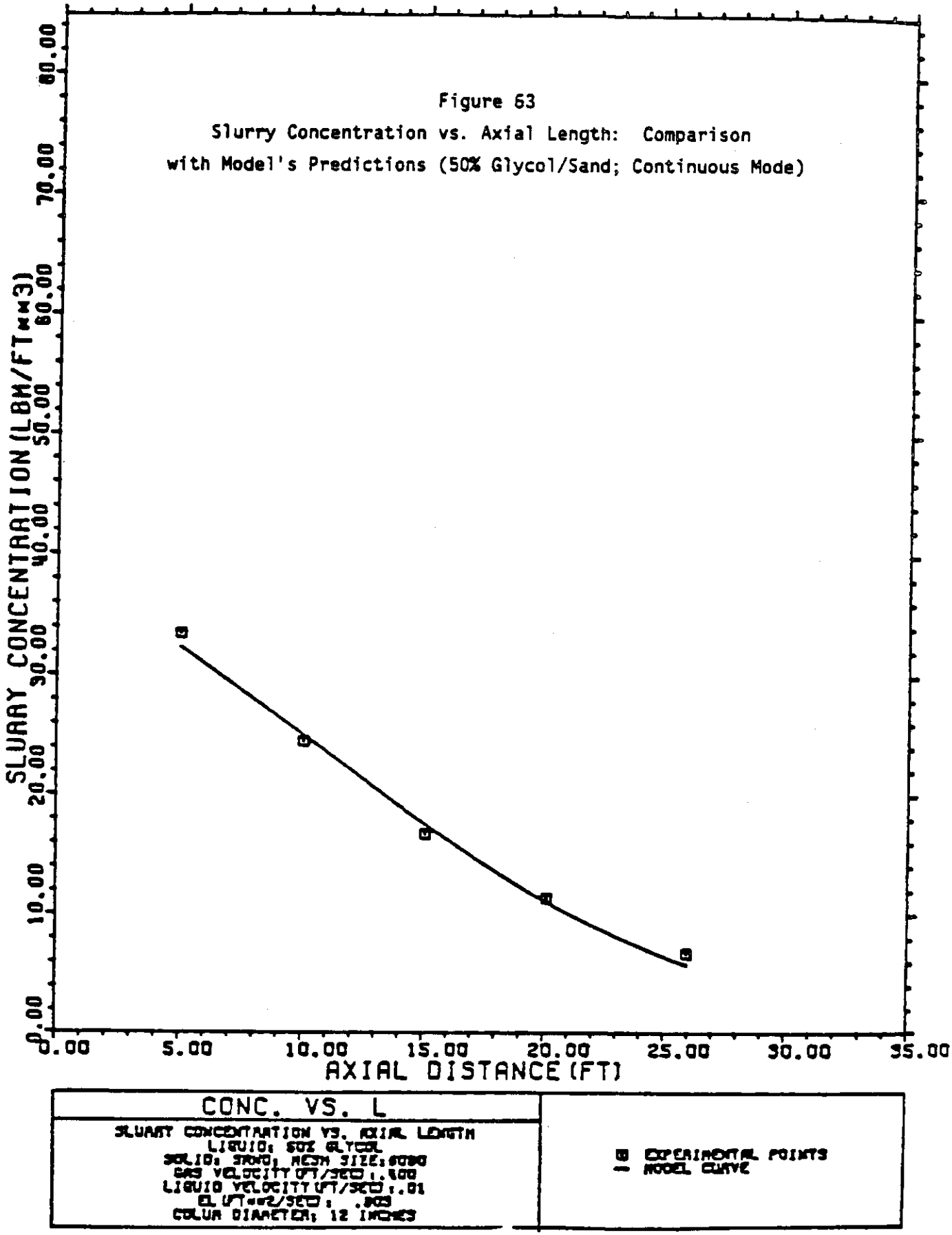
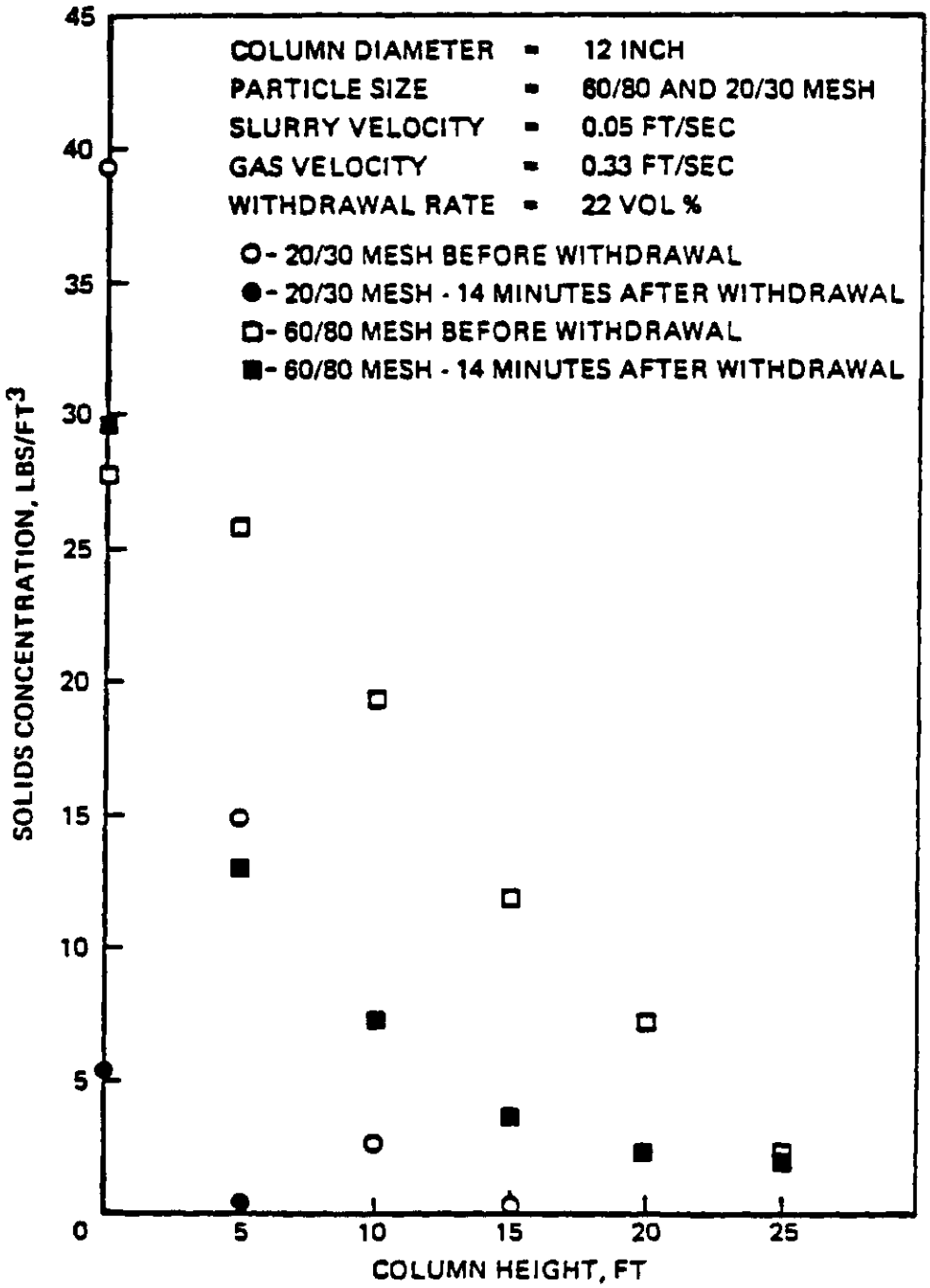


Figure 64

Effect of Large Particles on Solids Removal



Re = Reynolds number (nondimensional)

t = time (sec)

U_s = slip velocity between gas and liquid (ft/sec)

V_L = slurry velocity (ft/sec)

V_p = solid particles settling velocity (ft/sec)

V_{sg} or V_g = superficial gas velocity (ft/sec)

z = axial distance along column (ft)

ε_g = gas holdup (nondimensional)

μ_L = liquid dynamic viscosity (lb-ft/sec)

υ_L = liquid kinematic viscosity (ft^2/sec)

ρ_L = liquid density (lb/ft^3)

σ, γ = liquid surface tension (lb/sec^2)