3.WEEK

CHE 212 FLUID MECHANICS

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DIMENSIONLESS EQUATIONS

and

DIMENSIONAL ANALYSIS

- Equations which consist of terms having the same units are called dimensionally homogeneous equations. When such an equation is divided by any one of its terms, all units in each term cancel and only numerical magnitudes remain. These equations are called dimensionless equations.
- Mathematically derived equations are homogeneous dimensionless equations.
- Equations derived by empirical methods are usually dimensional equations.

DIMENSIONLESS EQUATIONS

and

DIMENSIONAL ANALYSIS

- Many important engineering problems cannot be solved completely by theoritical mathematical methods. Empirical methods are laborious and it is difficult to correlate the results.

- Dimensional analysis depend on the fact that if a theoritical equation exists among the variables affecting a physical process, that equation should be dimensionally homogeneous.

DIMENSIONLESS EQUATIONS

and

DIMENSIONAL ANALYSIS

- Rayleigh Method

According to Rayleigh method, all terms in the function, f must have the same dimensions as those of the left hand side of the equation.

- Buckingham Method

In thsi method listing of the important variables is done first. Then the number of dimensionless parameters are determined.

DIMENSIONLESS EQUATIONS

and

DIMENSIONAL ANALYSIS

WRITE THE FUNCTIONAL RELATIONSHIP

DETERMINE THE NET POWER OF EACH DIMENSION

APPLY THE PRINCIPLE OF DIMENSIONAL HOMOGENITY

SOLVE THE EQUATIONS