

Slurry Flow Regimes

As a further example, consider the flow regimes manifest by slurry (solid/liquid mixture) flow in a horizontal pipeline. When the particles are small so that their settling velocity is much less than the turbulent mixing velocities in the fluid and when the volume fraction of solids is low or moderate, the flow will be well-mixed. This is termed the *homogeneous* flow regime (figure 1) and typically only occurs in practical slurry pipelines when all the particle sizes are of the order of tens of microns or less. When somewhat larger particles are present, vertical gradients will occur in the concentration and the regime is termed *heterogeneous*; moreover the larger particles will tend to sediment faster and so a vertical size gradient will also occur. The limit of this heterogeneous flow regime occurs when the particles form a packed bed in the bottom of the pipe. When a packed bed develops, the flow regime is known as a *saltation* flow. In a saltation flow, solid material may be transported in two ways, either because the bed moves *en masse* or because material in suspension above the bed is carried along by the suspending fluid. Further analyses of these flow regimes, their transitions and their pressure gradients are included in sections (Nkb), (Nkc) and (Nkd). For further detail, the reader is referred to Shook and Roco (1991), Zandi and Govatos (1967), and Zandi (1971).

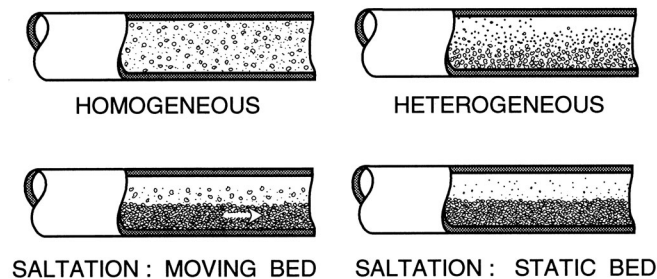


Figure 1: Flow regimes for slurry flow in a horizontal pipeline.