

Rheometry Techniques for scale-up design of slurry pipelines

Product/Process Profile

Using the HAAKE RheoStress 1 rheometer (Couette Type) flow curves of minerals/ores samples in CR and CS mode and Time curves are generated. Temperature programs are software controlled to determine the temperature dependence with controlled shear stress, shear rate or frequency. Yield points of mineral slurry can be determined with stress controlled ramps by using creep/recovery tests. Similarly, the Visco-elasticity of a fluid can be evaluated by a creep /recovery test or by dynamic measurements in CD (controlled deformation) or CS (Controlled stress) mode. Particle size distribution is determined by using Laser scattering particle size distribution analyzer (LA960 Horiba). The rheological parameters obtained from the rheological measurements are used to predict the pressure drop and hence the pumping power of a commercial slurry pipeline. For slurries with multi-sized and comparatively larger particles, a tube rheometry facility with 15 mm NB, 25 mm NB , 40 mm NB and 50 mm NB tubes has been designed and developed to characterize the flow behaviour of such slurries. The tube rheometry data with wall slip corrections can be used for scale-up design of high concentration slurry pipelines.

Application Area

- Ores & Mineral Processing Industries, Coal based Thermal Power plants etc.

Advantage

- True flow curves can be obtained with high accuracy after wall slip corrections
- The flow behavior of slurries with multisided and comparatively larger particles can be evaluated
- The rheological parameters from the true flow curve can be utilized for designing commercial slurry pipelines

Major Raw Materials/Plant Equipments/ Machinery/Gadgets

-HAAKE RheoStress 1 rheometer (Couette Type), Laser scattering particle size distribution analyzer (LA960 Horiba)

Scale of Development

- Lab/Pilot Scale

Validation Level

- By comparing the predicted head loss model data with pilot plant test data

Commercialization Status

- Many coal based power plants have adopted our scale –up designs including JSPL, Bhushan Steel & Power, NTPCs etc. for disposal of ash slurry at high solids concentrations

Techno-economics

- No elaborate pipe loop tests are required saving money and manpower

IP Status

- Rheological model parameters with basic design of HCSD system for disposal of ash slurry has been given to many given to NALCO, JSPL, BPSL, OPGC and many other private industries including NTPC Units

Technology Package

- Rheological Model, Know-how, basic design engineering packages.

