

# Hydrocyclone Micrometer Sized Separation Technology For Exploitation Of Natural Gas Hydrate

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Natural gas hydrate is a key future clean energy resource, and sand control is crucial in natural gas hydrate production. However, the sand control is still inefficient, which impedes industrialized development of natural gas hydrate. From production test carried out in the South China Sea, we found the separation of micrometer-sized sand from the fluid is the main challenge in sand control.

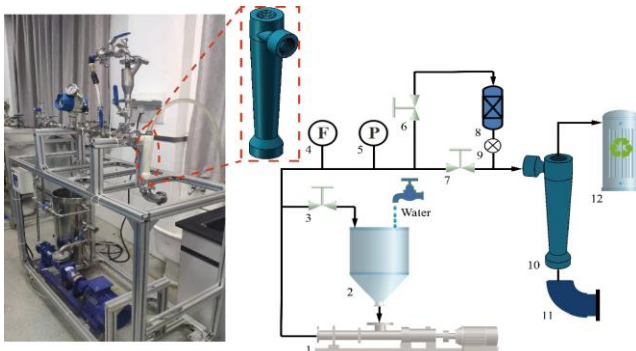


Figure 1—Experimental setup and flow diagram: 1-screw pump; 2-water storage tank; 3-bypass valve; 4-flow meter; 5-pressure gauge; 6-bypass valve; 7-main valve; 8-feeder; 9-discharge valve; 10-hydrocyclone; 11-stocker; 12-water circulation purification system.

From production test carried out in the South China Sea, we found the separation of micrometer-sized sand from the fluid is the main challenge in sand control. Based on high-speed motion in our 3D rotating turbulent flow field of hydrocyclone, our study presents a new technology to realize efficient separation of micrometer-sized sand and breaking consolidation between hydrate and sand.

As results of hydrocyclone separation experiments, we have the high separation efficiency that is up to 92.23% for silica sand and 98.23% for PP; also, only 0.46%~1.05% of PP powder remains in recovered materials. In conclusion, the technology proves the ability of breaking-consolidation and realizes the goal of separation of micrometer-sized particles, and thus improve the sand control in exploitation of marine natural gas hydrate.

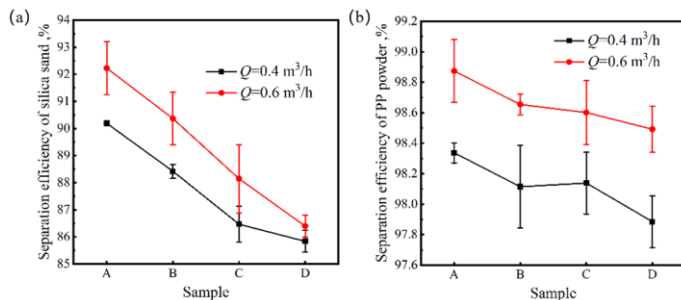


Figure 2—Separation efficiency: (a) silica sand and cement; (b) PP powder.

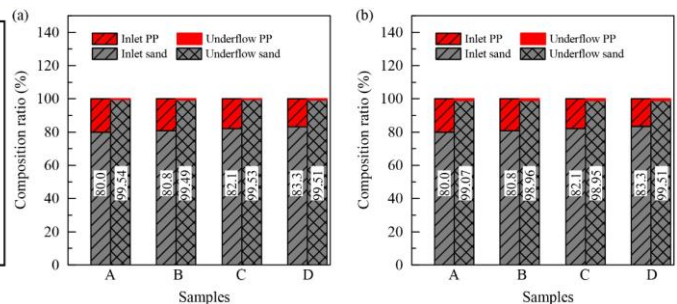


Figure 3—Composition ratio of silica sand and PP: (a) Q = 0.4m³/h; (b) Q = 0.6m³/h.