

# Newmix® - Levtech® Application note

## Mixing a Diatomaceous Earth Slurry using the Jet-Drive™ Mixer

Mixing system: Newmix®- Levtech® Jet-Drive™ system

Mixing bag: 200L A-Mix™ bag

Mixing type: Powder-liquid

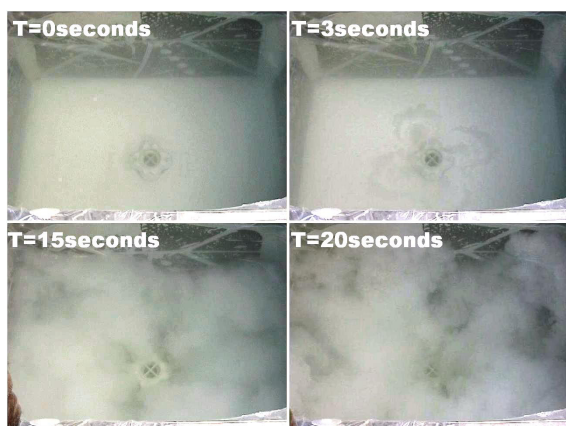
The Newmix-Levtech Jet-Drive system is one of the lightest and most compact disposable mixing systems. It consists of a cubical shaped disposable bag with a magnetically impelled turbine, secured to the bottom of the bag, working as a centrifugal pump.

The established 3D recirculation loop eliminates dead zones and ensures efficient and fast mixing.

## Introduction

Powder-liquid mixing is a common requirement in biopharma processing, and a cubical bag shape is generally considered to be preferable from a storage efficiency (footprint) viewpoint. However performing mixing in a cubical bag can be difficult; some mixing technologies can be prone to uneven distribution within the mixing bag, or can even introduce unwanted particulate contamination. The Jet-Drive impeller was developed to overcome these challenges.

In this experiment, a Jet-Drive mixer's ability to suspend a very high powder load, and its resistance to stalling when buried by compacted solid, was tested. The powder chosen was diatomaceous earth, a fine, inert and insoluble, powdered filter medium that is light and fluffy when it is dry, yet forms a dense mud when mixed with water.



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## Experimental

A 200L Jet-Drive mixing bag was filled with ~180L of water, and mixing speed was set to 1000rpm. Diatomaceous earth powder ( $d=0.22\mu\text{m}$ ) was then added until a total weight of 6kg was reached. The Jet-Drive provided sufficient agitation to maintain liquid movement and keep the majority of powder in suspension, although a substantial minority of the added powder settled on the bottom of the bag and was not held in suspension. The mixer was then shut off, and the suspended powder was allowed to settle into a dense, compacted mud at the bottom of the mixing bag. After the powder had settled, mixing was restarted, and the impeller's ability to resume mixing was observed.

## Results

The 6kg powder load was sufficient to completely bury the Jet-Drive impeller housing in a dense sedimentary mud. Despite its small size and magnetic coupling, the Jet-Drive impeller was able to smoothly and immediately resume mixing without stalling. The areas of the Jet-Drive bag swept by the fluid jets were clearly identified as the powder was rapidly and completely re-suspended in these locations, as shown in the accompanying image.

Despite its ability to resist stalling, and to rapidly re-suspend powder in the jet-swept areas, the limited size of the Jet-Drive impeller meant that its mixing action was noticeably less vigorous than with some other ATMI mixers. Although powder in the four "petal-shaped" areas of the mixing bag that were swept by the fluid jets did readily re-suspend, other areas of the bag did not receive sufficient agitation to re-suspend the powder, and thus a thick layer of settled powder was left covering approximately 50% of the bag bottom and some parts of the jet housing.

Video of this experiment is available upon request.

## Conclusions

The Newmix-Levtech Jet-Drive system is not very well suited to powder-liquid mixing applications, although it can be functional in applications where the powder load is not too heavy, where powder solubility is high, and where speedy dissolution is not a priority. If moderate/heavy loads of less soluble powders are expected, then alternative ATMI mixers (such as the Magnetic Mixer or Pad-Drive) are recommended as more efficient choices.

