

# Environmentally Friendly, Electro-mechanical Controller for Adjusting Pump Stroke

(2016-039)

Allows Site-specific Application of Fertilizer, Reducing Waste and Enhancing Environmental Quality

## Market Overview

This invention uses an electro-mechanical controller that allows the user to adjust the pump stroke on-the-go for site-specific applications. Currently, there are over two million crankshaft-type positive-displacement piston pumps in the USA which are used by row-crop and hay farmers for applying crop inputs. The outlet flow of these pumps can be changed by adjusting pump stroke manually by using specific tools provided by the company. The “on-the-go” outlet flow also can be varied by changing the drive shaft speed. However, for each manual setting, only limited range of flow rate can be achieved by changing the drive shaft speed. This limited flow range is not sufficient for applying variable-rate crop inputs in fields with tremendous amount of variations in soil types, resulting in practice that is wasteful, costly, and environmentally questionable. Clemson University researchers have developed an electro-mechanical controller for adjusting pump stroke that uses algorithms based on optical sensors which applies a fertilizer only where needed at optimum rate. This will result in reduced waste, increased profits, and enhanced environmental quality. The controller has the potential to be retrofitted on all existing piston pumps with market value of over \$1 billion.

## Technical Summary

This electro-mechanical controller for adjusting pump stroke is designed to replace the current manual stroke adjustment system on positive displacement piston pumps (Fig. 1). This affordable system could be retrofitted on any existing piston pump for real-time adjustment of the pump stroke, which makes it possible to change the flow rate of a piston pump automatically from zero to pump's full capacity. The system can be controlled using a pre-described position sequences or real-time sensor-based commands. In addition, the system can adjust pump stroke manually, using a pre-calibrated electric dial.

### Application

Agriculture equipment;  
chemical dispersing

### Development Stage

Provisional

### Advantages

- Can be used with GPS/GIS, allowing for precise and map-based application of crop inputs
- Allows site-specific application of fertilizer, decreasing agricultural waste and costs
- Applies fertilizer only where needed at optimum rate, making the approach more environmentally friendly

App Type	Country	Serial No.	Patent No.	CURF Ref. No.	Inventors
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Dr. Ahmad Khalilian earned his Ph.D. in Agricultural Engineering from Oklahoma State University and his M.S. from University of California Davis. His research interests include precision farming technology, which includes development of innovative sensors, tools, and methodology for site-specific management of soil, pest, nutrient and water.



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