

PC-BASED PID NUTRIENT MIXING PROCESS FOR FERTIGATION SYSTEM

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*Dengan nama Allah yang Maha Pemurah lagi Maha Pengasih.
To my beloved, supportive wife Ainun Munirah Kamaruddin,
and my daughter Nurhana Safiyya*

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ABSTRAK

Fertigasi merupakan satu teknik bagi membekalkan tanaman dengan baja melalui kaedah pengairan. Ia merupakan teknik pertanian yang moden bagi memaksimumkan hasil dan mengurangkan pencemaran alam sekitar melalui pengawalan penggunaan baja yang cekap seterusnya meningkatkan pulangan ke atas baja yang dilaburkan. Dengan menggunakan teknik fertigasi, masa, jumlah dan kepekatan baja yang digunakan dapat dikawal. Keperluan nutrien tanaman sangat bergantung kepada peringkat biologi pertumbuhan. Ia berbeza dari peringkat pembenihan sehingga menuai. Matlamat projek ini adalah untuk mereka bentuk, memberikan keboleharapan dan mengekalkan proses pencampuran baja fertigasi set A dan set B pada nilai yang diperlukan dengan menggunakan pengawal, PID. Pam kadar aliran yang tepat digunakan untuk menyuntik kedua-dua baja set A dan set B pada kekonduksian elektrik (KE) tertentu, diikuti dengan kadar pengambilan nutrien tumbuhan berdasarkan sistem pengairan berjadual. Kerintangan elektrik campuran baja dijadikan sebagai proksi kepada kebolehubahan nutrien. Keberkesanan sistem diuji melalui eksperimen. Oleh itu prototaip sistem fertigasi berasaskan komputer dibina bagi mengumpul dan menganalisis data pengukuran, (KE). Maklumat sebenar digunakan sebagai bandingan untuk mengesahkan kejituan sistem kawalan PID. Kajian menunjukkan proses pencampuran baja set A, set B dan air menggunakan pengawal PID dapat meningkatkan kecekapan pencampuran baja merujuk kepada nilai yang dikehendaki.

ABSTRACT

The practice of supplying crops in the field with fertilizers via the irrigation water is called fertigation. It is a modern agro-technique which provides an excellent opportunity to maximize yield and minimize environmental pollution by increasing fertilizer use efficiency, minimizing fertilizer application and increasing return on the fertilizer invested. In fertigation, timing, amounts and concentration of fertilizers applied are easily controlled. The nutrient requirement of crops is very much dependent on the biological stage of growth, varying from seeding to harvest. The goal of this project is to design, provide reliable and maintain a mixing process of fertilizer set A and set B at set point using PID controller. The precise proportional flow rate pump is used to inject both fertilizers set A and set B at predecided electrical conductivity (EC) value followed by plant nutrient uptake rate on a time-base irrigation system. Electrical resistivity of the mixing fertilizer liquid is to be considered as a proxy for the variability of nutrient properties. Validation of a model is determined by experiment. Therefore a prototype of fertigation system based on PC-based is built to collect and analyse the measurement data of EC. The result shows that the mixing process of fertilizers set A, set B and water using PID controller has been able to increase the efficiency of mixing fertilizer level according to the set point.