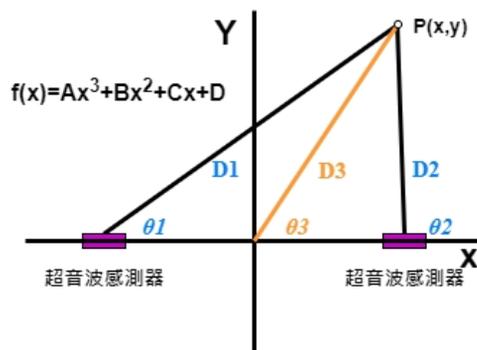


**JOURNAL:** Undergoing research partially published in conferences

**TOPIC:** An electric wheelchair capable of following the user

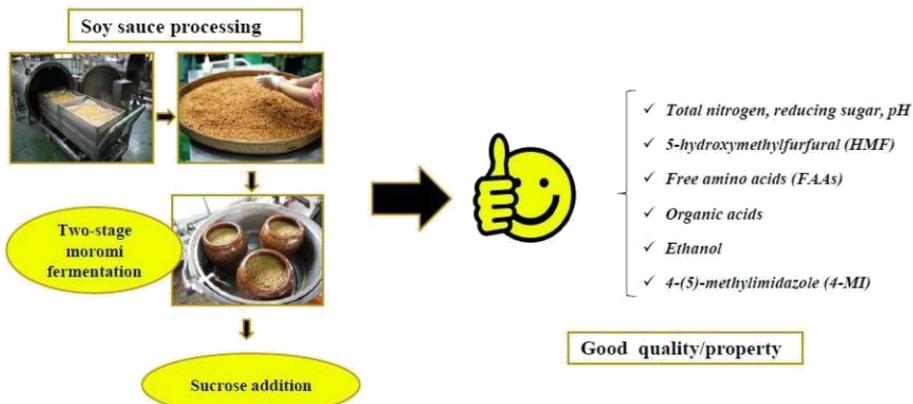
**ABSTRACT:** Population aging is an unavoidable trend in developed countries. The first unpleasant experience faced by an elderly is impaired mobility or paralyzed lower limbs. Peoples with malfunctioning lower limbs can be assisted with mobility facilities such as electric scooters, manual wheelchairs, or electric wheelchairs. This phenomenon is more common in daily life of a population -aging society. Impaired low limbs will deteriorate rapidly without sufficient exercise. People relying on mobility facilities but still have walking ability once leaving mobility facilities shall walk back to the parking place. This returning procedure may decrease the user's desire of walking. A user will be happier to walk if the facilities follow. Walk improves the functionality of the lower limbs, delay the deterioration, and improve the cardiorespiratory function and hence the health. Thus an electric wheelchair of following capability will increase the user's desire of taking exercise by walking. A wheelchair with autonomous tracking function is not only just mobility facilities but also rehabilitation equipment. We used cubic spline functions for predicting the user's trajectory and four ultrasound sensors for localisation. The wheelchair can follow a user autonomously and can avoid obstacles. The user can also manipulate the wheelchair and select the tracking function using a mobile through Bluetooth communication. Moreover, we designed App switch in Bluetooth to change mode between auto and manual.



JOURNAL: International Food Research Journal

TOPIC: Sucrose addition and two-stage fermentation process to improve the properties of soy sauce

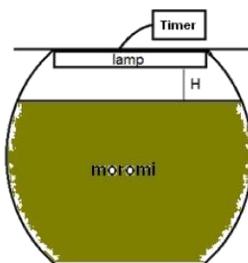
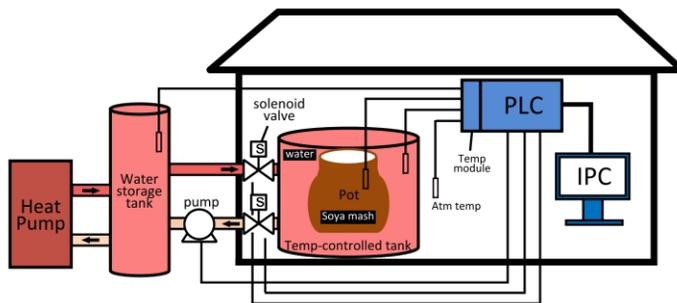
**ABSTRACT:** The effect of sucrose addition on the quality of soy sauce fermented by two-stage moromi was evaluated. During the first fermentation stage, koji was mixed with 10% brine solution and incubated at 40°C for 5 days. The second stage was conducted using 18% brine solution at 30°C for 3 months. Sucrose was added at the beginning of first or second stage. Accumulation of high total nitrogen (1.71 g/100 ml) and free amino acid (~69 mg/g moromi) contents, and supplementation of high fermentable sugar content within 5 days or 2 weeks resulted in the significant increases in soy sauce quality. Additionally, the absence of 4-(5)-methylimidazole revealed the safety and reliability of the two-stage moromi fermentation approach. This approach was proven a feasible reproducible process for industrial application for the improvement in produced soy sauce properties.



JOURNAL: Proceedings of Engineering and Technology Innovation

TOPIC: Ultra-Violet Treatment for Fermenting Low-Salt Soya Sauce

**ABSTRACT:** Low-salt soya sauce has become a market trend due to consumers' demand for a low sodium diet life. In tradition, a low-salt soya sauce (with salt concentration below 14.4%) is made from a high-salt one (18% salt concentration) through diluting or reducing the sodium content. The post-processing deteriorates the quality of the soya sauce produce as some specific, beneficial chemical components are inevitably removed. In the production of a native-born low-salt soya sauce, a key problem encountered is possible microbial contamination that easily develops in a low salt environment. In this study, we evaluated the effect of ultra-violet (UVC 254 nm) irradiation on soya mash of 12% salt concentration fermented at 35°C. The ultra-violet treatment could effectively prevent the soya mash from microbial contamination.



(a) UVC setup



(b) tank lid with a UVC lamp and a temperature sensor mounted

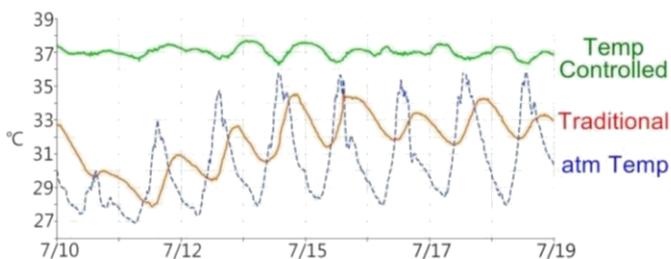
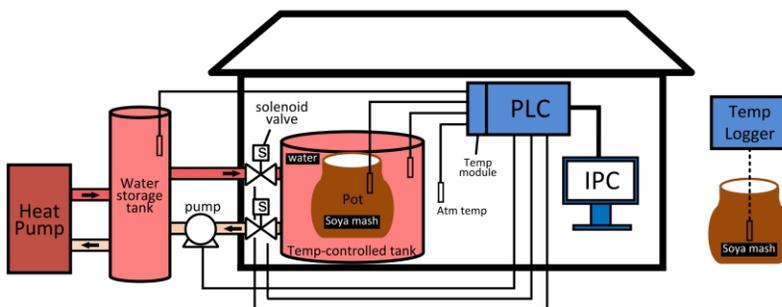


(c) complete setup

JOURNAL: Advances in Technology Innovation

TOPIC: A Controlled Fermentation Environment for Producing Quality Soya Sauce

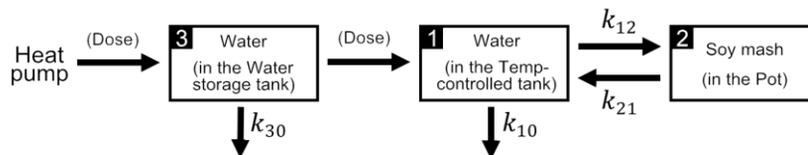
**ABSTRACT:** Soy sauce fermentation under controlled temperature is a way to shorten the fermentation time. An energy-saving fermentation system was developed to power a heat pump for maintaining the temperature of sauce moromi at  $37\pm 1^\circ\text{C}$  during fermentation. The chemical properties of the sauce moromi and the sensory properties of the soy sauce produced using the controlled fermentation system were evaluated and compared to those of the sauce moromi fermented outdoors without temperature control. The sauce moromi processed using the controlled fermentation system had significantly higher total nitrogen, formal nitrogen, amino nitrogen, reducing sugar and organic acid contents than the moromi fermented outdoor. However, no significant difference was found in overall liking score between two soy sauces. The soy sauce fermented under the control temperature showed higher Brix and salt concentration, but lower pH value than the sauce fermented outdoor. It was possible that the beneficial effects of reducing sugar and organic acid contents were rebuffed by the disadvantage of salt concentration. It was concluded that a controlled fermentation environment deserves the potential to produce a high quality soy sauce.



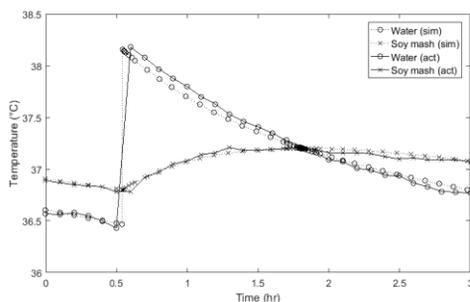
JOURNAL: Advances in Technology Innovation

TOPIC: Energy-effective Predictive Temperature Control for Soy Mash Fermentation Based on Compartmental Pharmacokinetic Modelling

**ABSTRACT:** Compartment modelling has been successfully used in pharmacokinetics to describe the kinetics of drug distribution in body tissues. In this study, the technique is adopted to describe the dynamics of temperature response and energy exchange in a soy mash fermentation system. The objective is to provide a precise temperature-controlled atmosphere for effective fermentation with the premise of energy saving. In analogy to pharmacokinetics, water and mash tanks are treated as compartments, energy flow as drug delivery, and the temperature as the drug concentration in a specific compartment. The model allows us to estimate the time of injecting a certain amount of energy to a specific tank (compartment) in a cost-effective way. Thus, model-based temperature control and energy management can be possible.



- $k_{12}$  : The transfer constant of heat in circulation water transfer to soy mash ( $s^{-1}$ )
- $k_{21}$  : The transfer constant of heat in soy mash transfer to circulation water ( $s^{-1}$ )
- $k_{10}$  : The transfer constant of heat in circulation water dissipate into the air ( $s^{-1}$ )
- $k_{30}$  : The transfer constant of heat in storage water dissipate into the air ( $s^{-1}$ )



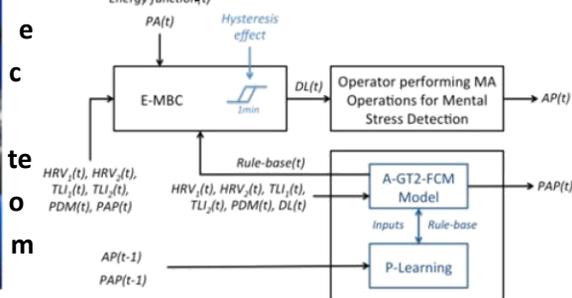
JOURNAL: IEEE TRANSACTIONS ON FUZZY SYSTEMS

TOPIC: Psychophysiologicaly Based Real-Time Adaptive General Type 2 Fuzzy Modeling and Self-Organizing Control of Operator's Performance Undertaking a Cognitive Task

**ABSTRACT:** This paper presents a new modeling and control fuzzy -based framework validated with real-time experiments on human participants experiencing stress via mental arithmetic cognitive tasks identified through psychophysiological markers. The ultimate aim of the modeling/control framework is to prevent performance breakdown in human - computer interactive systems with a special focus on human performance. Two designed modeling/control experiments which consist of carrying -out arithmetic operations of varying difficulty levels were performed by ten participants (operators) in the study. With this new technique, modeling is achieved through a new adaptive, self -organizing, and interpretable modeling framework based on general Type -2 fuzzy sets. This framework is able to learn in real time through the implementation of a restructured performance learning algorithm that identifies important features in the data without the need for prior training. The information learnt by the model is later exploited via an energy model based controller that infers adequate control actions by changing the difficulty level of the arithmetic operations in the human -computer interaction system; these actions being based



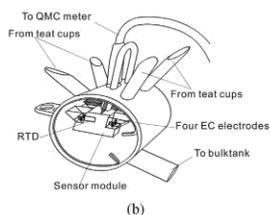
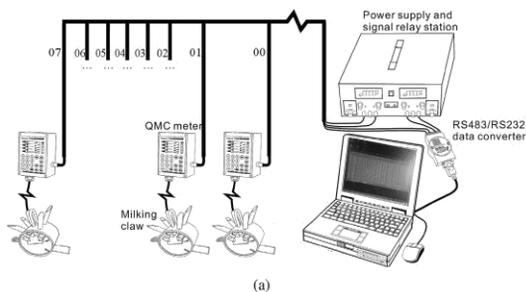
state of the subject under



**JOURNAL:** Engineering in Agriculture, Environment and Food

**TOPIC:** Online detection of dairy cow subclinical mastitis using electrical conductivity indices of milk

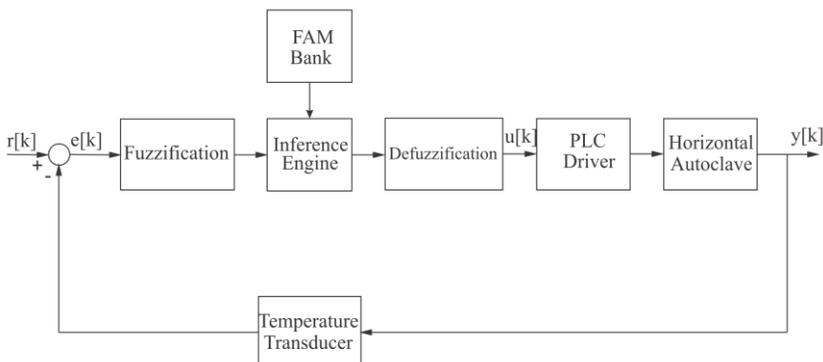
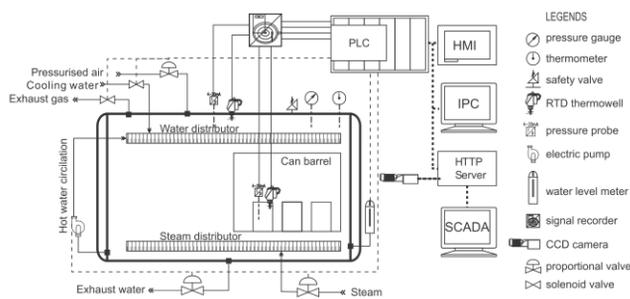
**ABSTRACT:** Existing commercial cow mastitis detectors require bulky historical data which may be unavailable or are considered expensive in conventional or small parlours. Thus, the objective of this study is to develop a simple, but without significant sacrifice of accuracy, online cow subclinical mastitis detector for conventional and small parlours. The detective indices are derived merely from the electrical conductivity (EC) of milk using linear discriminant and step regression analyses. The detector was validated on 192 milkings of 48 dairy cows from conventional, small parlours. It had a specificity of 83.7% for healthy quarters, a sensitivity of 46.2% for infected quarters, a prediction accuracy of 90.8% for healthy quarters, and a prediction accuracy of 30.7% for infected quarters. The performance is poorer than commercial detectors, but it is good enough for the dairy industry. This study gives the possibility to give alerts in the milking parlour and no need for animal identification.



**JOURNAL:** Engineering in Agriculture, Environment and Food

**TOPIC:** Fuzzy logic for accurate control of heating temperature and duration in canned food sterilisation

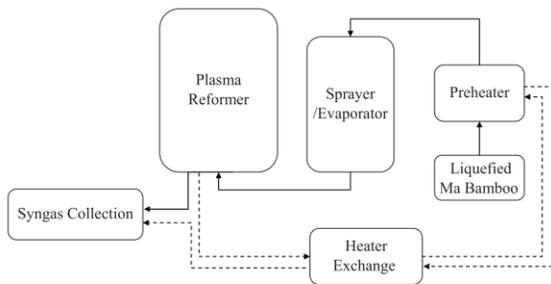
**ABSTRACT:** Autoclave thermal process is an important sterilisation procedure in the food canning industry. The performance of sterilisation is determined by the heating temperature and duration and the pressure in the autoclave, as well as by product's properties. In this study, a fuzzy logic controller is developed to maintain a small steady-state temperature error ( $121 \pm 0.5\text{C}$ ) for an sterilising duration ( $F_0$ ) by adapting to process deviations in the autoclave. The precise temperature control associated with on-line  $F_0$  updation assures food stuff that can be heated at the specified temperature for an expected duration and could lead therefore to successful sterilisation. The controls are implemented on a PLC (programmable logic controller) for affordability, reliability, and robustness and the operations are supervised using a web-based SCADA (supervisory control and data acquisition) system for remotely supervisory monitoring and control.



JOURNAL: Taiwan J For Sci

TOPIC: Pilot Study of Hydrogen-Rich Syngas Production from Ma Bamboo (*Dendrocalamus latiflorus*) by Plasma Reforming

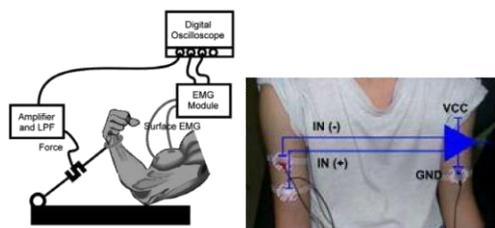
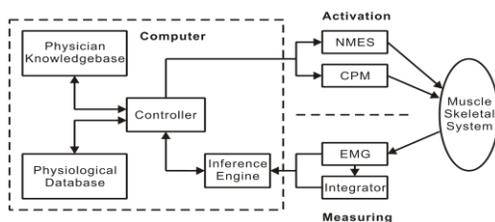
**ABSTRACT:** Major components of bamboo are solid hydrocarbons in the forms of cellulose, hemicellulose, lignins, and pentosan. The abundance of hydrocarbons indicates the potential of bamboo to be an excellent raw material to produce hydrogen. In this study, 1-yr-old ma bamboo (*Dendrocalamus latiflorus*) was liquefied with polyethylene glycol and then treated with plasma steam reforming to produce hydrogen. Productivity levels of hydrogen at different bamboo concentrations and pyrolysis temperatures were experimentally and theoretically studied. The liquefaction and pyrolysis apparatuses were hence optimized. A maximum productivity occurred at a weight ratio of 1: 10 of ma bamboo to water and a pyrolysis temperature of 800°C by plasma treatment.



**JOURNAL:** International Journal of Computer, Consumer and Control

**TOPIC:** Modelling of Neuromuscular Interactions with Electromyographic Biofeedback

**ABSTRACT:** The surface electromyography (sEMG) is a useful biofeedback signal for exploring neuromuscular interactions which are important in rehabilitation applications. Thus, a neuromuscular model that correlates muscular force generation and sEMG is developed in this paper. The model was developed based on muscular forces and corresponding sEMG responses measured on 10 volunteers. Linear correlation exists between the two biosignals and generated muscular forces can therefore be easily converted from sEMG measurements with a constant factor. Surface EMG signals were furthered to fit a Hill-type neuromuscular model. The model was validated with the acquired biosignals from 5 volunteers. The prediction error is less than 20%.



(a)

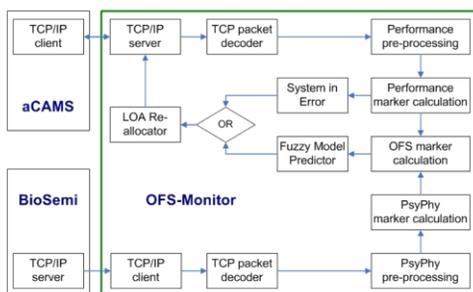
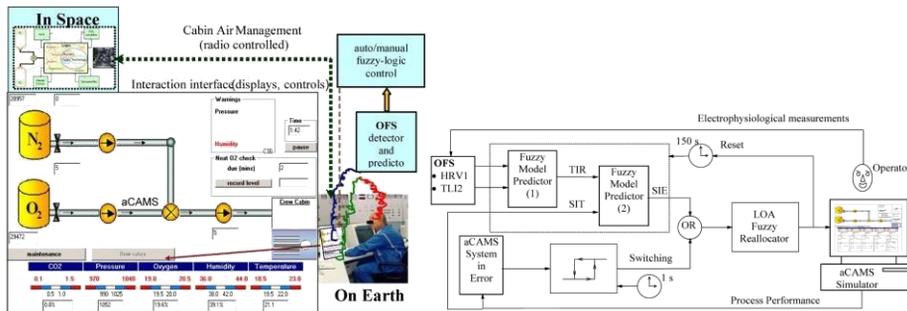
(b)



JOURNAL: IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS—PART A: SYSTEMS AND HUMANS

TOPIC: Real-Time Adaptive Automation System Based on Identification of Operator Functional State in Simulated Process Control Operations

**ABSTRACT:** This paper proposes a new framework for the online monitoring and adaptive control of automation in complex and safety-critical human-machine systems using psychophysiological markers relating to humans under mental stress. The starting point of this framework relates to the assessment of the so-called operator functional state using psychophysiological measures. An adaptive fuzzy model linking heart-rate variability and task load index with the subjects' optimal performance has been elicited and validated offline via a series of experiments involving process control tasks simulated on an automation-enhanced Cabin Air Management System. The elicited model has been used as the basis for an online control system via the predictions of the system performance indicators corresponding to the operator stressful state. These indicators have been used by a fuzzy decision maker to modify the level of automation under which the system may operate. A real-time architecture has been developed as a platform for this approach. It has been validated in a series of human volunteer studies with promising improvement in performance.

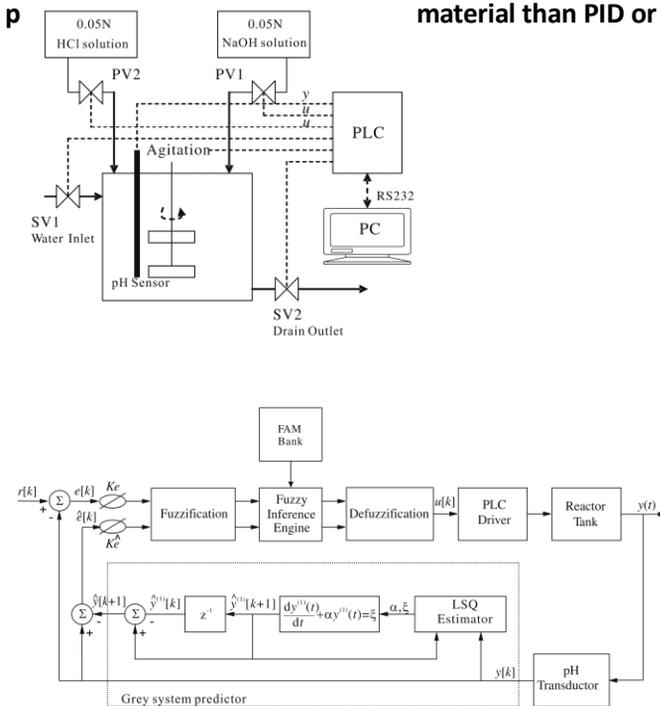


JOURNAL: Journal of Food Engineering

TOPIC: Grey prediction fuzzy control for pH processes in the food industry

**ABSTRACT:** Proper regulation of pH value is an important issue in the food industry for quality production. A food pH process usually has non-linear dynamics with system uncertainty. This study treats the pH regulation process of a reactor tank as a grey box with partially known system information. The behaviour of the process is predicted one-step ahead with a first-order grey model. A fuzzy controller takes the prediction together with the current system response to regulate the discharge of base (NaOH) or acid (HCl) solution into the reactor tank to arrive at a desired pH value. The integrated grey prediction fuzzy control (GPFC) strategy is simple in control-law derivation and system implementation and is efficient in computation. The developed GPFC was validated with perform base/acid titration and continuous acidification/deacidification control. The controlled system response error was trivial in the titration and was less than 1% in the continuous control under proper agitation of the reactants. The system was used to control Acetobacter xylinum fermentation for cellulose production. The GPFC scheme exerted smooth control action, achieved a trivial steady-state error in pH control, and yielded more cellulose and acetic acid

material than PID or manual control.



JOURNAL: Control Engineering Practice

TOPIC: A PID ratio control for removal of HCl/SO<sub>x</sub> in flue gas from refuse municipal incinerators

**ABSTRACT:** This paper presents a PID -based ratio control scheme for flue gas cleaning systems (FGCSs) to remove acid emissions (SO<sub>x</sub> and HCl) from municipal refuse incinerators. The FGCS uses a semi -dry scrubber that injects diluted hydrated lime droplets to scrub high temperature, polluted flue gas from incinerators. The development of the control scheme was initiated by treating the scrubbing process as a grey system perceived as conceptual chemical dynamics. The scheme was implemented on a redundant programmable logic controller (PLC) and the control parameters were tuned based on responses from commissioning operations. The scheme, never re-tuned, has accomplished promising performance and consumable savings since its commission in the year 2000

