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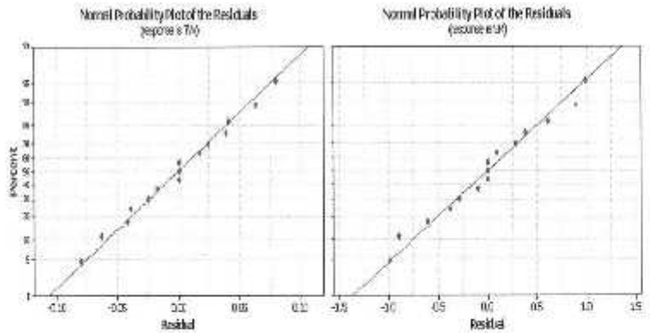
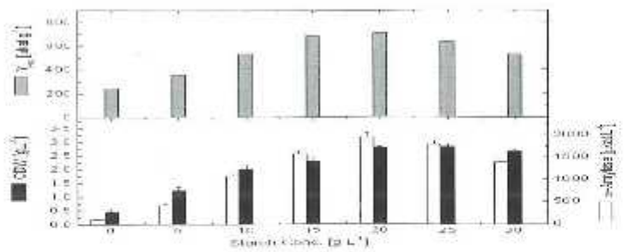
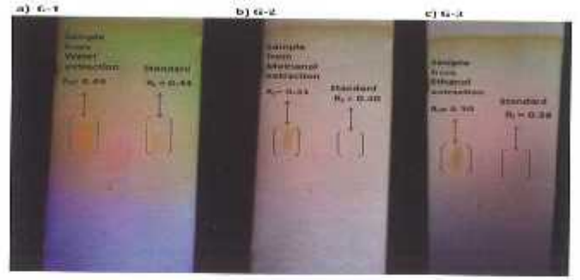
CONTENTS

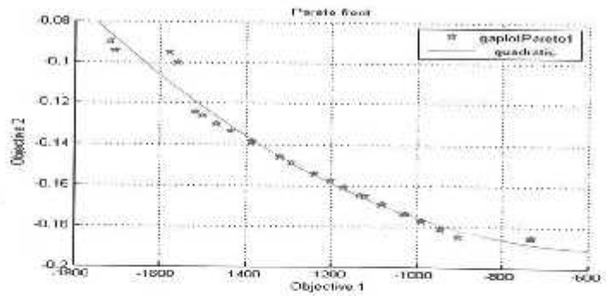
Management & Information Technology



S & T and Industrial Research

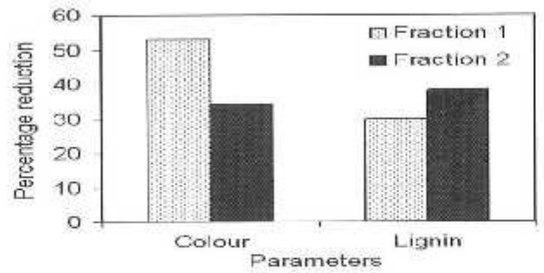




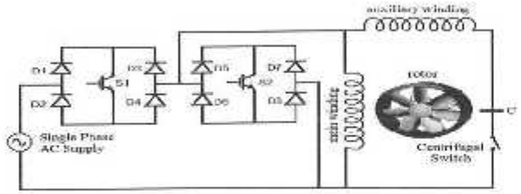


Energy and Environment

Native fungal isolates F1 - F8 and control fungi *Phanerochaete chrysosporium* were capable of degrading pulp and paper industry effluent and also efficient producers of cellulolytic and lignolytic enzymes. F3 (*Paecilomyces* sp) strain showed higher enzyme activity as compared to other native fungal isolates. Weight loss, cellulose loss and organic carbon contents were found maximum in F3. Reducing sugar, protein content and colour removing potential was also higher in F3. Color reduction initiated very fast with microbial enzyme treatment (initiated only after 2h of incubation) and reached maximum reduction after 24h. Lignin peroxidase fraction I and II resulted in 53% and 34% removal of colour and 36% and 38% lignin removal. The culture extract of F3 strain grown on pulp and paper effluent consists of five protein fractions and out of them two fractions of 38 and 40 kDa molecular weight showed lignin peroxidase activity. The pH and temperature optimum for lignin peroxidase activity were 2 to 3, and 20 - 30 °C, respectively. Maximum activity was observed at 6 mM to 48 mM veratryl alcohol concentration and 256 mM H_2O_2, however, sodium azide inhibits the enzyme activity. Different metals ($CoCl_2$, $HgSO_4$, $CaCl_2$, $SnCl_2$, $FeSO_4$, $CuSO_4$ and $ZnSO_4$) also affected the lignin peroxidase activity.

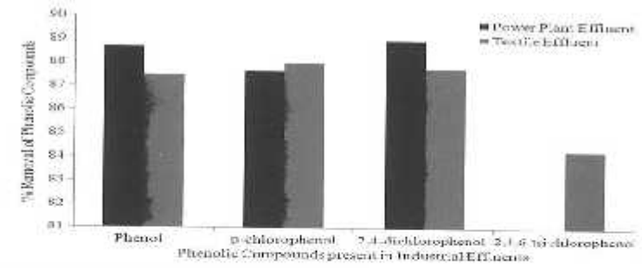


Power quality is not a big problem for low power motors and it becomes a problem in the places where multiple motors are in operation. In this paper, Genetic Algorithm is used to identify the best switching angles to eliminate selected harmonic in the output of the AC chopper. Load value is not mandatory to be known to calculate the switching angles are one of the main advantages of the proposed algorithm. Total Harmonic Distortion of output voltage is calculated from the obtained switching angles and embraced in the proposed fitness function. AC chopper with single phase induction motor model is developed in the MATLAB/SIMULINK environment. High quality output is derived due to the absence of low order harmonics. High efficiency is also achieved by the induction motor drive when it is operated with the proposed technique. Simulation results are validated through the designed prototype in which Genetic algorithm is implemented with the FPGA controller. Simulation and experimental results show that the proposed technique is effective.



Waste Utilization

Response surface methodology (RSM) was employed to optimize the removal of phenol from aqueous solution by ionic liquid [Bmim]BF4] dissolved in TBP. Central Composite Design (CCD) with four variables (aqueous phase pH, agitation speed, feed concentration, treat ratio) was applied to optimize the extraction process. The optimized conditions for maximum removal of phenol were pH - 6, agitation speed - 350 rpm, feed phase concentration - 10 ppm and treat ratio - 5 respectively. The optimized response for removal of phenol was found to be 98.88 % and the experimental result was found to be 98%. This shows the best fit with the proposed statistical model for phenol removal (R2=0.983). Extraction studies were performed for the removal of phenol, p-chlorophenol (p-CP), 2, 4-dichlorophenol (2,4-DCP) and 2,4,6-trichlorophenol (2,4,6-TCP) from synthetic phenolic mixtures, power plant effluent and textile effluent using [Bmim][BF4] in TBP. The results showed that the percentage extraction of phenols from synthetic mixtures and industrial effluents were found to be 98%, 88% and 86% respectively. Based on the above results, it was found that this process was best suited for secondary or tertiary treatment of phenols from industrial wastewater before disposal.



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