

पेटेंट कार्यालय
शासकीय जर्नल

**OFFICIAL JOURNAL
OF
THE PATENT OFFICE**

निर्गमन सं. 48/2024
ISSUE NO. 48/2024

शुक्रवार
FRIDAY

दिनांक: 29/11/2024
DATE: 29/11/2024

पेटेंट कार्यालय का एक प्रकाशन
PUBLICATION OF THE PATENT OFFICE

(12) PATENT APPLICATION PUBLICATION

(21) Application No.202411088841 A

(19) INDIA

(22) Date of filing of Application :17/11/2024

(43) Publication Date : 29/11/2024

(54) Title of the invention : BIOCHEMICAL REACTOR SYSTEM FOR INTEGRATED WASTEWATER TREATMENT AND ENHANCED RESOURCE RECOVERY

(51) International classification :C02F3/02, C02F3/24, C02F9/14
(86) International Application No :NA
Filing Date :NA
(87) International Publication No : NA
(61) Patent of Addition to Application Number :NA
Filing Date :NA
(62) Divisional to Application Number :NA
Filing Date :NA

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(57) Abstract :

ABSTRACT A biochemical reactor system (100) for wastewater treatment and resource recovery integrates a biochemical treatment reactor (102), a nutrient extraction unit (104), a bioenergy production module (106), a monitoring and control subsystem (108), and an effluent discharge and conditioning unit (110). The treatment reactor (102) facilitates microbial degradation of contaminants under aerobic and anaerobic conditions. Nutrients, including nitrogen and phosphorus, are selectively extracted via the nutrient extraction unit (104). The bioenergy module (106) converts organic waste to biogas for energy recovery. Real-time sensors in the monitoring subsystem (108) optimize treatment conditions, while the discharge unit (110) ensures wastewater quality for reuse or safe discharge. This system maximizes efficiency in both wastewater purification and resource valorization. FIG. 1

No. of Pages : 20 No. of Claims : 10