

## Industrial Consultancy & Sponsored Research (IC&SR)

### Integrated-Modular Onsite Urine Treatment Unit for Recovery of Water and Green Chemicals

#### IITM Technology Available for Licensing

#### PROBLEM STATEMENT

- Generally, major sources of nutrient like **nitrogen, potassium & phosphorous** in wastewater is from urine & accumulation of the **minerals & nutrients** (nitrogen, phosphorous, potassium) in surface water due to **poor wastewater management** leads to **eutrophication** (algal bloom) in the surface waters, making them **unusable**.
- Further there are a few prior art discussed which does not disclosed about the integrated treatment unit used for recovering nutrients from urine. Hence, there is a need an improved system & method.

#### INTELLECTUAL PROPERTY

IITM IDF Ref. 2099; IN Patent No: 411075

#### TECHNOLOGY CATEGORY/MARKET

**Technology:**; Onsite Urine Treatment Unit

**Industry:** Environment Engineering, Waste Treatment, Waste Management;

**Applications:** Waste management-treatment;

**Market:** The global external urine management market is projected to grow at a **CAGR of 4.9%** during **2023-2030**.

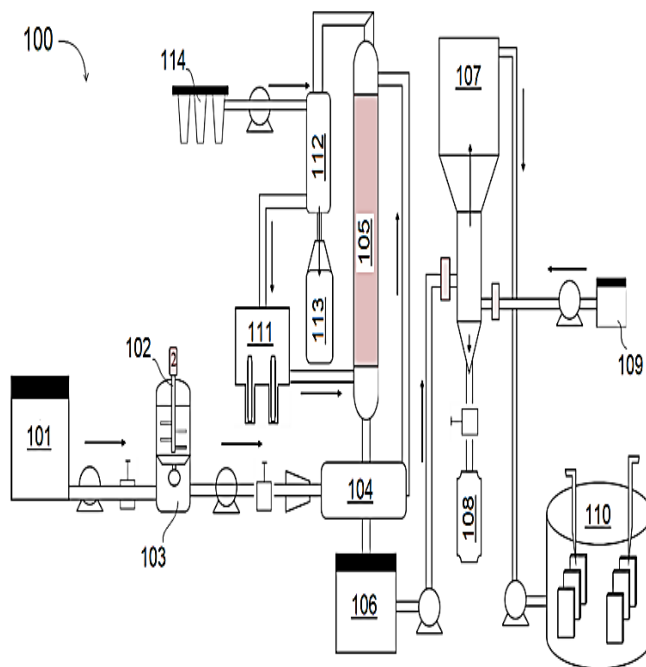
#### TRL (TECHNOLOGY READINESS LEVEL)

**TRL-4**, Proof of Concept ready, tested in lab.

#### TECHNOLOGY

- The present invention describes a **system and process for recovering water & nutrients from urine**.
- The System includes a **urine storage tank, a hydrolysis tank, a distillation column, a steam generator, a condenser, a struvite reactor & an electrochemical reactor**.
- The hydrolysis tank is configured to **hydrolyse urea** present in urine to **ammonium & bicarbonate**.
- The distillation column convert **ammonium to gaseous ammonia** at **temp > 100°C** at operating pressure **< 0.5 bar**.

- Said steam generator is configured to generate steam into the distillation column.
- Said condenser is configured to condense gaseous ammonia to liquid ammonia & **obtained depleted urine**.
- Said struvite reactor is configured to obtained ammonia & phosphate depleted urine.
- The Electrochemical reactor is configured to **degrade pollutants in the depleted urine to the top of the reactor**.
- The **process** for recovering water & nutrients from urine is depicted in the figures. (Refer FIGs 1,2, 3 & 4)



**Fig.1: Illustrates the claimed integrated system;**

#### RESEARCH LAB

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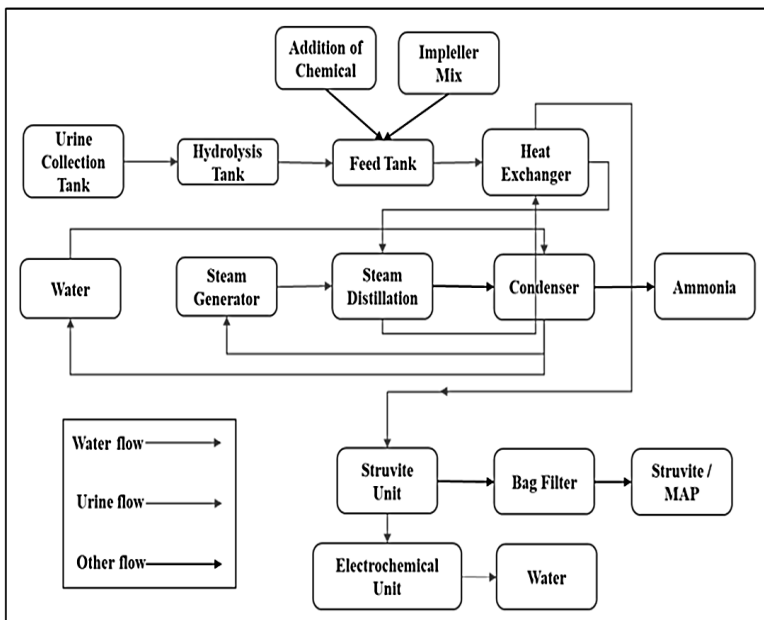
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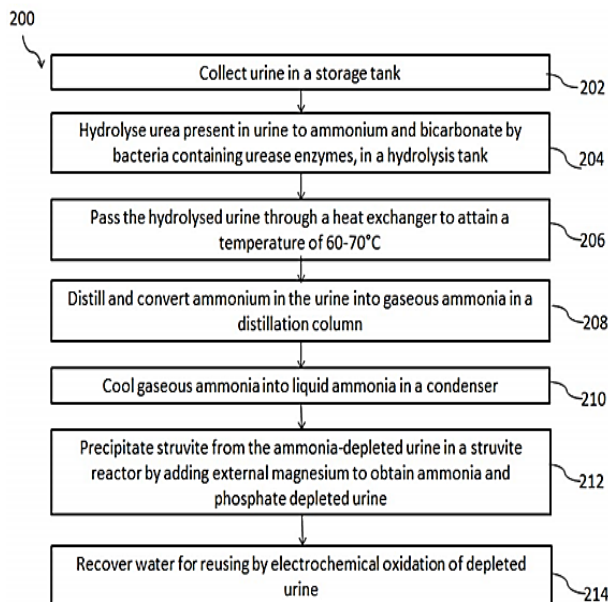
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### Image



**Fig.2: Illustrates the claimed process**



**Fig.3: Illustrates flow chart for the complete process for recovering water and nutrients from urine;**

### KEY FEATURES / VALUE PROPOSITION

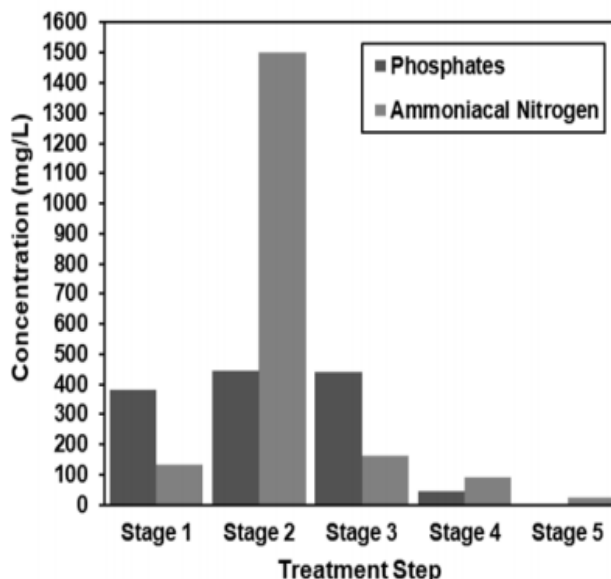
#### ❖ Technical Perspective:

- The distillation column convert **ammonium to gaseous ammonia** at **temp > 100°C** at **operating pressure < 0.5 bar**.
- The **ammonium recovered** is 95%.
- The **percentage recovery of phosphate** in the struvite reactor is in a **range of 95-98**.
- Finally, the **pollutant** is an **antibiotic** & the reduction achieved is from a level of **1014 ppb** or less to **undetectable levels**.
- The ammonia & phosphate depleted urine is transferred to an electrochemical reactor to degrade pollutants in urine & **recover water**.

#### ❖ Industrial Perspective:

- It's an **ecofriendly, cost-effective advanced integrated system & process** for **recovering of water & nutrients/green chemicals from human & mammal**.
- User friendly system with **recovery of enhanced nutrients**;
- Required **minimal energy consumption**.

### Result



**Fig. 4: Illustrates the variation in the concentrations of phosphate and ammoniacal nitrogen at each treatment step;**

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