# CERIE: Ciledug's Environmental Recycling Initiative Empowered by IoT-Driven Pyrolysis and Solar PV for Community Waste Banks - Indonesia

*EPICS in IEEE - 2025 Proposals*

## *Indonesia*

Ms Safitri Juanita

## *Ms Safitri Juanita*

safitri.juanita@budiluhur.ac.id
O: +6283898928000

# Application Form

## Project Name*

Please include the country in the project title.

**Example:** Wave and wind energy - Cameroon

Please limit your Project Title to 150 characters.

CERIE: Ciledug's Environmental Recycling Initiative Empowered by IoT-Driven Pyrolysis and Solar PV for Community Waste Banks - Indonesia

## IEEE Member Number*

If you are not a current member, please put N/A.

97846326

## IEEE Region (select one)*

Region 10 - Asia & Pacific

## IEEE Section (if known)

Indonesia

## Entity Type*

What IEEE entity is leading this project?

Student Branch (SB)

## If "Other" Entity Type, please describe

## Entity Name*

For your entity name, please use the following examples as a guide: Wisconsin University of Milwaukee SB; Gamma Upsilon Chapter; Katholieke Universiteit Leuven WIE SB Affinity Group

Institut Teknologi Sepuluh Nopember (ITS) Student Branch

## If applicable, please add the name and email for the faculty advisor for the project.*

If you are a student group, please include the name and email of your faculty advisor. If this is not applicable to your project, please put N/A.

Dion Setiawan, S.T., M.T.(dionsetiawan@budiluhur.ac.id) (diona4.10@gmail.com)

## Non-Profit Organization/Non-Governmental Organization Name*

This is the organization your IEEE entity is working with to solve the community problem.

Bank Sampah Darling

## Please list any additional groups that you are partnering with for your project.*

If applicable, please list any additional groups that you are partnering with for your project such as government agencies or corporations. If you are not working with any additional groups, please add N/A.

N/A

## Approximate number of total university students (undergrad & graduate) directly involved in project?*

4

## Approximate # of university students(undergrad & graduate) identifying as women directly involved?*

3

## Total number of people impacted/benefactors of the proposed project in the short term (1 year)*

250

## Total number of people impacted/benefactors of the proposed project in the long-term (3+ years)*

350

## Total Number of IEEE Volunteers (not including student members)*

7

## Requested Funds (USD)*

Enter the amount of the grant you are requesting from EPICS in IEEE (in US dollars). Grant range are typically between $500 and $10,000.

$6,294.97

## Project Category*

Please select one or more categories.

Environment

## Project Location (Select one country only)*

Indonesia

## EPICS in IEEE Partners

If you are affiliated with any of the EPICS in IEEE Society Partners, please select the group from the list below.

Industry Applications Society (IAS)

## Partner Member Name and Number

If you selected one of our partners from the drop-down menu above please include the name and member number of the Partner member engaged with your project. Some funding being distributed by the committee is restricted to only those projects with an affiliated partner member on the team.

Rizka Aulia (101273861); Alifa Zalsa Bila (101273858); Rekhan Fadhillah Syahputra (101273910)

# Project Details

## Problem Statement*

Please provide the problem statement that your project is trying to solve.

Ciledug Sub-district, with its estimated 309,000 residents (2024), is also among the large waste producers in Tangerang City. Around 1,800 tonnes of rubbish is channeled daily to the Rawa Kucing landfill, which is nearing its limits. Bank Sampah Darling, a community-powered voluntary movement, was formed to reduce waste by recycling and sorting. However, over 35% of waste that arrives is low-value plastics such as food packaging and styrofoam unmarketable and hard to recycle. High operating costs, particularly for fuel used by shredders and transportation, are a major sustainability concern. A proposed solution is an IoT-driven pyrolysis system that converts such plastics to liquid fuel. This fuel can, in turn, be utilized to run the machinery and vehicles of the waste bank, reducing fossil fuel dependency and encouraging a local circular economy. The technology improves plastic waste treatment with the ability of utilizing community-level waste management using renewable energy.

## Project Description*

Please provide a brief description of your technical solution or approach to solving the problem.

The proposed project is an IoT-based smart scale powered by photovoltaics that can perform automated weighing and recording. While conventional scales require waste bank activists to manually weigh, categorize, record, and compile daily data, our scales perform these processes automatically. This is done by utilizing a scale automation system that is connected to the Internet of Things server developed for Bank Sampah. The scales still require a human to manage the weighing IDs and categories of waste that are weighed and deposited into the Waste Bank and stored in a temporary local database before being sent to the server at the end of the day. The data stored on the server every day will be manageable, monitored by the waste bank management. On the community side, this can be used to monitor the amount of waste they have deposited, view waste bank management publications and get certain rewards according to the program carried out by each waste bank. The system will use embedded system integration to integrate all the sensors, actuators, and drivers that control the entire system. One embedded system will be used as the logic controller of all sensors, input devices, and output devices connected to the photovoltaic energy generation system, as well as weighing devices and user input devices. The rest will be used primarily for data acquisition and communication with the IoT server. Then, the data used can be used as input for a mobile-based visualization system used by the community and waste bank managers.

The logic controller system will:
1. Utilizing energy generated by the solar power system and using voltage, current, and temperature sensors to monitor the efficiency of the solar panels that act as the energy provider for the system. The system will ensure optimal use of solar energy by continuously monitoring these key parameters to enhance the performance of the pyrolysis machine and reduce reliance on conventional energy sources.

2. Monitoring the characteristics of the output products from the pyrolysis system, including both valuable products (such as oil and fuel) and non-valuable byproducts (such as smoke). This process involves evaluating the quality and quantity of the products to ensure that usable resources are maximized, while minimizing the environmental impact of non-reusable byproducts.

3. Receiving input from users regarding the justification of the waste processed by the pyrolysis machine and logging the data related to the machine's usage and operational status. The system will continuously collect

and record information about the waste being processed, ensuring that all data is documented for analysis and future optimization.

4. Detecting abnormal system behavior and identifying potential failures within the system. The system will be designed to automatically detect issues such as equipment malfunction or performance decline, alerting operators promptly to prevent prolonged system downtime and ensuring continuous, efficient operation.

5. Reporting all sensor and actuator status to a Raspberry Pi via serial communication. This communication system ensures real-time data transmission, providing operators and stakeholders with detailed reports on system performance and enabling immediate actions to maintain optimal functionality.

## What are the main technologies used in the project?*

Please describe at a high level what technologies are used in this project and the level of expertise within the project team. If there are non-IEEE technologies in the project, does the team have access to appropriate expertise and training materials to successfully implement those technologies?

The technologies implemented in this project comprise several advanced components aimed at enhancing waste management efficiency and promoting a circular economy. A key feature of the project is the integration of IoT-based pyrolysis technology, which enables the conversion of plastic waste into reusable fuel. This process is managed and monitored through an IoT system. Additionally, the project employs solar panel technology to generate renewable energy, supplying power to the pyrolysis machine and thereby reducing dependence on fossil fuels.

The project team is composed of members with diverse expertise, including Electrical Engineering, Informatics, and Renewable Energy Technology. The team brings extensive experience in research and development at Institut Teknologi Sepuluh Nopember and Universitas Budi Luhur, particularly in areas such as IoT, programming, and sensor-based systems. With a strong command of both hardware and software, the team is well-equipped to manage and implement projects involving renewable energy technologies.

While the majority of the technologies used in this initiative are based on IEEE standards, the project also incorporates specific non-IEEE technologies, including the pyrolysis system and specialized industrial sensors. For these components, the team has access to appropriate training resources and supporting documentation to ensure proper implementation. In addition, the team has established collaborations with industry partners that offer hands-on training and technical guidance, further supporting the successful execution of the project.

## Project Inputs*

Please describe the necessary resources or materials to complete your project (such as personnel, physical materials or software).

The members of Bank Sampah Darling are enthusiastic about supporting our program and live in Kampung Darling, Tangerang City. It is hoped that the partnership that EPICS will fund would help the community and expand its chances for economic development and circulation. Our solution blends renewable technology with the Internet of Things. Budi Luhur University experts and students worked together on this project. The project that will be showcased is an application of some of the research we have conducted on the subject of IoT and Renewable Energy in the Electrical Engineering lab at Budi Luhur University.

IoT-related research is mainly related to data acquisition, computer networks, data visualization, sensors, actuators and etc. On the other hand, energy-related research focuses on renewable energy and energy optimization. With our research experience and equipment resources, we hope that this funding can make a major contribution to the development of the social, environmental and economic circulation of the people of Tangerang city. The equipment that we will need for this project are Digital Scales, Controllers (containing embedded systems related to several sensors and actuators). The software and libraries that will be needed are open-source such as Arduino, Android Studio, Python and MQTT. The energy system in this project will utilize the energy collected by the PV system.

## Project Activities and Outputs*

Please describe the project steps and any deliverables you will design, create, or deploy.

This Project will be done in several steps:

1. The Project will start with a site visit with the aim of designing a system that fits the neighborhood. the things we note here are:
    a. The placement method, position, and size specifications of the pyrolysis machine.
    b. Information related to the design of the pyrolysis machine and its disposal

2. After creating and proposing a suitable machine design, we will make a presentation with the local party to receive additional suggestions and approvals. This process will take approximately two months.

3. After the design is approved, we will start the project as soon as possible by purchasing the required materials and hiring local craftsmen or vendors who are experts in making pyrolysis machines with home specifications that require special skills. As this process will require manufacturing, and delivery will take at least two months.

4. Once all the materials arrive, we will start within three months:
    a. The hardware development consists of:
        1. Pyrolysis machine installation.
        2. Solar panel installation to supply electric power for pyrolysis machine IoT system.
        3. Sensor and actuator installation on pyrolysis machine and power supply system.

    b. The software development consists of
        1. Development of an IoT system dashboard to read reports and logging data of the pyrolysis machine usage system so that it can be monitored by partners.
        2. Server integration to facilitate data transmission between sensors, actuators, servers and IoT dashboards. This process will use python and C++.
        3. Control program to control sensors and actuators where the MQTT protocol will play an important role to facilitate the communication of sensors, actuators with the internet.

    c. Process integrity testing IoT workflow with pyrolysis workflow.

5. The primary partners will be trained to independently operate and maintain the pyrolysis machine and IoT system within the time we have left. Furthermore, in order to prepare socialization, we will invite partners to lead the pyrolysis machine and invite waste bank networks owned by partners, such as waste banks surrounding partners and associated echelons.

## Project Innovation*

The EPICS in IEEE committee values innovative projects. Please describe which parts of your project are procured (purchased off-the-shelf) vs those that are being engineered (designed by the students). Provide a brief summary of what products are already on the market and how your project differs and/or improves upon existing products.

The primary innovation of this project lies in the integration of IoT technology with pyrolysis powered by renewable energy. Unlike conventional waste processing systems that rely on fossil fuels, this system uses solar energy to power the pyrolysis machine and IoT-based sensors. These sensors automatically monitor and record the waste processing data, making the system more efficient and eco-friendly.

One of the major breakthroughs of this project is its ability to convert low-value plastics, which are typically discarded or difficult to recycle, into usable liquid fuel. This fuel can then be used to operate shredding machines and transport vehicles for the Waste Bank, reducing reliance on fossil fuels and making the process self-sustaining. By incorporating IoT, this system allows for real-time monitoring and control, providing waste bank managers and the community with detailed insights into the system's performance.

Furthermore, the system utilizes embedded systems to integrate all the sensors, actuators, and controllers for managing data acquisition and communication between devices. This ensures smooth operation, quick detection of system failures, and optimal resource management.

This project is not just a technological innovation but also a social innovation by empowering local communities with tools to transform waste into valuable resources. By adopting a circular economy model, this project addresses environmental issues while simultaneously generating economic benefits for the local community.

## Project Safety Considerations*

Please review the Safety Considerations Document to determine your project's potential risks. After reviewing the safety considerations document, describe this project's potential risks and unintended consequences, including, but not limited to, the risk to people, property, and IEEE reputation. How will these be mitigated? Make sure to explain with as much detail as possible what measures will be taken to prevent safety hazards. Please also highlight any political or economic risk associated with the country in which the project is located. *[The IEEE Office of Risk and Insurance Management Services (ORIMS) will review proposals to assess risk and provide guidance.]*

The proposed project, which integrates IoT-driven pyrolysis technology for managing plastic waste, involves various potential risks that need careful consideration during its design, development, and implementation stages. One of the key risks relates to electrical hazards. Since the project includes the installation of solar panels and pyrolysis machinery that utilize electricity, there are inherent risks of electric shocks if the electrical system is mishandled or improperly wired. In such cases, the safety of both the operators and the surrounding community could be compromised. To mitigate this, electrical safety protocols must be strictly followed, such as using Personal Protective Equipment (PPE) during installation and maintenance, and conducting regular safety inspections of electrical wiring to ensure compliance with safety standards.

In addition to electrical risks, mechanical hazards also need to be carefully addressed. The pyrolysis machine operates at high temperatures (ranging from 400-500°C), posing risks of burns or other injuries if

individuals come into contact with the hot surfaces or moving parts. To reduce the likelihood of such incidents, physical barriers should be installed to restrict access to dangerous areas, and an automatic fire suppression system should be integrated to manage potential fire hazards. Moreover, comprehensive safety training for all personnel will ensure they are well-informed about the proper procedures to avoid burn injuries or other accidents.

Furthermore, harmful emissions from the pyrolysis process represent another significant safety risk. The gases emitted during this process could pose health hazards to workers if not properly controlled. Given this, the installation of gas sensors to monitor and regulate emissions is essential. Additionally, an effective ventilation system and air filters should be used to ensure the safety of workers and the surrounding environment, limiting exposure to potentially hazardous gases.

Beyond these physical risks, the project could face risks to IEEE's reputation if safety measures are not properly implemented or if the project results in unintended environmental harm. If mishandled, the project could damage IEEE's image as an organization committed to responsible innovation. To safeguard IEEE's reputation, environmental regulations must be strictly adhered to, and the project should undergo an environmental impact assessment to evaluate potential risks. Furthermore, ensuring transparency and open communication with local stakeholders will help prevent any backlash from the community or other involved parties.

In terms of political and economic risks, Indonesia, where the project is located, presents specific challenges. There are potential regulatory risks due to evolving government policies related to environmental protection and waste management, which could hinder the project's progress. Furthermore, economic factors such as fluctuations in fuel prices or the cost of materials may affect the overall project budget and sustainability. To address these challenges, it is crucial to maintain close collaboration with local authorities, ensuring all required permits are secured and regulatory standards are met. Partnerships with NGOs, private companies, and international organizations will also help provide additional financial stability and reduce the risks associated with economic instability or regulatory changes.

To ensure the project's success and minimize potential risks, a comprehensive safety plan will be developed. This plan will address the identified hazards by implementing safety measures such as training, use of PPE, automated systems, and continuous monitoring. The project will also ensure compliance with all local regulations and maintain open communication with stakeholders to minimize risks to people, property, and IEEE's reputation. With proactive risk management and adherence to safety standards, the project will not only achieve its technological goals but also ensure the long-term sustainability and safety of all involved.

## Ethics Review*

Does your project need to go through an IRB or ethics review board? Please justify your answer below. If your project has already gone through an IRB review, please add those details here.

This project has gone through an ethical review process conducted by Prof Mauridhy Hery Purnomo (ITS Professor) and Akhmad Musafa (Faculty of Engineering Lecturer). The review process was conducted by examining the problems faced by the Darling Waste Bank Group through interviews on 17 April at Jl. Bulak Permai Jl. Janur Kuning 2 No.56, Sudimara Jaya, Kec. Ciledug, Tangerang City, Banten, Indonesia.

Prof Mauridhy Hery Purnomo provided input on writing strategies and key solutions on waste management, ensuring that Non-Profit and NGO partners use accurate and correct location-based addresses according to Indonesian standards. On the other hand, Akhmad Musafa provided inputs on how to make the visual block diagram easier to understand by following the Input-Process-Output pattern. This was followed

by a thorough review of each of the fields in the proposal to ensure that the answers provided were aligned with the relevant questions in the proposal.

## Project Duration*

Please provide the number of months to complete the project.

12

## Project Maintenance and Sustainability*

Please describe how the project will be maintained after completion and who will be responsible for the maintenance. Please include the expected lifespan after project delivery.

Once the hardware and software have been completed and tested, the official handover of ownership of the device will be made to Darling Waste Bank. Thus, to ensure the usefulness of our project, the various maintenance processes that will be carried out are:

1. Providing software and hardware user manuals, including simple troubleshooting for hardware and software related problems.
2. Conducting demonstrations and training on the use of the tools to key users.
3. Maintain the dashboard version and update it if needed.

Meanwhile, to ensure the sustainability of this project, we will:

1. Create project documentation related to the tool architecture well to facilitate maintenance and further development.
2. Conduct media publications of this project to expand the good impact of this project. And invite the nearest legal agencies such as the sub-district to conduct socialization related to the utilization of pyrolysis in the kampung darling waste bank.
3. Provide a feedback form for users to capture ideas for further development.

## Project Impact*

Describe how you will assess if the project was a success. Estimate the number of people that will benefit from the project. Where applicable, provide geographic areas, gender, age group, etc.

This project will impact waste bank customers and the environment in Ciledug. With this technology, the manager and customers of the Bank Sampah Darling (250 people at the current year) will be able to manage low value plastic waste in the market by utilising the pyrolysis results as additional fuel to reduce their daily operational costs. While the number of customers in Bank Sampah Darling increases in a range of 1-2 people a month, thus we estimate that there will be 350 customers in Bank Sampah Darling by the third year of our program. It is also possible that the impact can be expanded by utilising the network of fellow waste banks around the Ciledug sub-district, which has at least 186 waste banks by rough estimation. In addition, the customers of the waste bank will get added value because the plastic waste that could not be sold at first has a selling value for both parties. Then, the input-output process of pyrolysis processing can be monitored by an IoT-based electronic system that utilises renewable energy so as to get reports related to the current machine

performance and the amount of pyrolysis products. Thus, the amount of low-value plastic waste can be processed and reduce the volume of waste sent to landfill.

## Student Learning Outcomes*

What skills (including technical and/or soft skills) are the students developing, strengthening, and/or applying practically during the project? Please specify different outcomes for university students and/or high school students as relevant.

Fully funded by EPICS, the hard and soft skills of the members will be prioritized for the success of this project. At the very least, this project will require soft skills such as good communication, teamwork, problem solving, time management, cultural competence and collaboration from each member and volunteer. Our team consists of various members with different backgrounds and fields of study, so this project requires excellent communication. In addition, these different backgrounds are the main strengths of our team, especially in hard skills. That means there will be a decrease in knowledge, sharing of skills and transfer of knowledge that will occur for the success of each member and at every step. That way students, lecturers, and volunteers from various study programs, different backgrounds can learn from each other's study programs. By maintaining a good flow of information for each member, we are confident that each step in this project will be able to run well.

**Supplemental Files**

**Please upload your detailed budget file here, along with any other important documents such as design descriptions or flow diagrams.**

## Project Budget*

Please provide an itemized budget in US dollars.

project budgetv1.pdf

## Project Budget Justification*

Explain the need for the items listed as "Expenses" in your Project Budget. Please review the EPICS in IEEE Budget Training prior to submitting your budget, included in the training is access to a budget template.

StainlessThe main system in this project will utilize a pyrolysis unit to process sorted plastic waste into pyrolysis products in the form of oil and oil. The pyrolysis machine consists of the main pyrolysis materials such as materials composed of stainless steel that are resistant to high temperatures (high temperature resistant materials so that they do not burn during the pyrolysis process).

- SUS304 Stainless Steel Plate (100x110 cm): Primary material used to build the pyrolysis reactor due to its high resistance to heat and corrosion.
- 1” Stainless Steel Pipe (1.5 mm thickness): Functions as the conduit for transferring vapor or gas produced during pyrolysis to the condenser or fuel collection system.
- 1” Brass Gate Valve: Manually controls the flow of liquid fuel or gas through the piping system.

- 600°C Thermometer: Measures internal reactor temperature to ensure optimal thermal conditions for plastic decomposition
- 3 kg LPG Gas Cylinder: Provides initial heating energy for the pyrolysis process, especially when solar energy is insufficient.
- 30x30x3 mm Angle Iron, Hollow Iron, Steel Elbow: Main structural materials for the reactor frame, support stands, and system housing.
- Welding Machine, Welding Electrodes, Welding Wire: Tools and materials used for assembling and welding metal components of the pyrolysis unit.
- Protective Gloves: Personal protective equipment used during construction, welding, and installation processes.
- Assembly Costs: Covers labor and materials for assembling the reactor, frame, and supporting systems.

This project requires IoT electronic devices (sensors, actuators, Raspberry Pi 5) to collect data from various parts of the system to measure and record the pyrolysis machine process while it is working in each process cycle. A controller box will also be needed to protect these electronic devices.

- Raspberry Pi 5: Functions as the central controller of the IoT system, managing sensors, actuators, temperature control, and data transmission to the dashboard.
- Loadcell 50 kg: A weight sensor used to measure the amount of plastic input fed into the pyrolysis reactor.
- Solar panel outboard temperature sensor: Measures the temperature of the solar panel to record the efficiency of the power generated each day.MQ-2 LPG Gas Sensor: Detects potential LPG gas leaks around the reactor as part of the system's safety measures.
- Relay: Automatically controls the flow of electricity to components such as heaters, fans, or actuators based on programmed logic.
- FORT Electrical Panel Box (80x60x30 cm): A weatherproof enclosure designed to house electrical components including relays, MCBs, the Raspberry Pi, and sensors to protect them from environmental hazards.
- Cable, Cable Gland, Cable Ties, PMD 25x25 Cable Duct: Supporting components used for safe, neat, and secure cable installation and protection against physical or environmental interference.
- Internet Router: Enables the Raspberry Pi to connect to the internet, allowing real-time data transmission to the monitoring dashboard.
- Installation Costs: Includes the cost of setting up the pyrolysis system, solar panel infrastructure, and IoT components.

Solar power generation systems (solar panels/photovoltaic) will be needed because IoT systems will utilize this generated energy. As a renewable energy that is available at a certain time (morning to evening), a power storage system along with a power distribution regulation system will be needed.

- 450 WP Solar Panel: Serves as the main power supply for the system, harnessing renewable solar energy.
- SCC Solar Charger Controller 10A 12V/24V: Regulates power flow from the solar panel to the battery to prevent overcharging.
- Yuasa 12V 80Ah Battery: Stores solar power for system operation during the night or cloudy conditions.

To prevent fire, we will provide a device to deal with one of the hazardous situations that are very likely to occur in this pyrolysis machine.

- Fire Extinguisher: Required safety equipment to mitigate fire hazards in the event of gas leaks or overheating.

In order to expand the impact of this project, several steps of familiarization, engagement and training will be required. Especially regarding the complete pyrolysis machine usage procedure and risk management. Thus, training and training modules will be needed for the directly related communities. Then publicize on the community's social media and socialize to the community.

- Booklet Development, Community Outreach, and Publicity
- Supports documentation of the system, educates local communities on its use and impact, and promotes the project's outcomes through publications and public campaigns.

## Additional File 1 (Optional)

**Examples:**
Supporting documents
Preliminary technical documentation

System Diagram.pdf

## Additional File 2 (Optional)

**Examples:**
Supporting documents
Preliminary technical documentation

# *Collaborators*

## NPO/NGO Name*

Bank Sampah Darling

## NPO/NGO Full Address*

Jl. Kav. Bulak Permai Jl. Janur Kuning 2 No. 56, RT.04/RW.11, Kel. Sudimara Jaya, Kec. Ciledug, Kota Tangerang, Banten 15151, Indonesia.

## Please add a link to the NPO/NGO website.

Please add a link to the NPO/NGO website. If the NPO/NGO does not have a website, please add n/a.

## NPO/NGO Point of Contact Name*

Sobirin

## NPO/NGO Point of Contact Email*

darlingbsu@gmail.com

## NPO/NGO Point of Contact Telephone (Optional)

081291105566

## Mission*

What is the mission of the non-profit/NGO and how does the proposed project support this mission?

1. Minimize Environmental Damage by efficiently managing plastic waste, converting it into usable fuel through IoT-based pyrolysis technology.
2. Empower Local Communities by offering tools and technologies that foster efficient, sustainable waste management and create economic opportunities through a circular economy.
3. Promote Environmental Awareness by educating the community on the importance of waste management, proper waste sorting, and the environmental impacts of poor waste disposal.

This project directly aligns with the first and second mission objectives by managing plastic waste at Bank Sampah Darling and empowering the Ciledug community. The community faces challenges in recycling low-value plastics, often discarded due to lack of recycling value. With IoT-based pyrolysis, waste can be converted into liquid fuel for machine and vehicle operation, reducing fossil fuel reliance and supporting renewable energy through solar-powered systems.

## Support letter from NGO*

The support letter should show how the NGO will be involved in the project and the plan for sustainability. Please upload via the file upload area below.

Support Letter .jpg

## Are you working with a high school?*

No

## Project Team

### Project Leader: First Name*

Safitri

### Project Leader: Last Name*

Juanita

### Project Leader: Email Address*

safitri.juanita@budiluhur.ac.id

### Project Leader:  Telephone Number*

+6283898928000

### Is the Project Leader a member of IEEE?*

Yes

### Is the Project Leader a student?*

Yes

### Is there a second member of the team?*

Yes

## Second Team Member

### If the second team member has a specific role, please specify:

Example roles might include: community liaison, technical lead, finance manager, publicity, etc.

Finance manager

## Second Team Member: First Name*

Rizka

## Second Team Member: Last Name*

Aulia

## Second Team Member: Email Address*

2252500018@student.budiluhur.ac.id

## Second Team Member: Telephone Number*

+6282277227271

## Is the Second Team Member a Student?

Yes

## Is the Second Team Member a member of IEEE?*

Yes

## Is there a third member of the team?*

Yes

# *Fourth Team Member*

## If the fourth team member has a specific role, please specify:

Example roles might include: community liaison, technical lead, finance manager, publicity, etc.

Technical lead

## Fourth Team Member: First Name*

Rekhan Fadhillah

## Fourth Team Member: Last Name*

Syahputra

## Fourth Team Member: Email Address*

2313500122@student.budiluhur.ac.id

## Fourth Team Member: Telephone Number*

101273910

## Is the Fourth Team Member a Student?

Yes

## Is the Fourth Team Member a member of IEEE?*

Yes

# *Third Team Member*

## If the third team member has a specific role, please specify:

Example roles might include: community liaison, technical lead, finance manager, publicity, etc.

Publicity and Socials

## Third Team Member: First Name*

Alifa

### Third Team Member: Last Name*

Zalsa Bila

### Third Team Member: Email Address*

2412501724@student.budiluhur.ac.id

### Third Team Member: Telephone Number*

+6289519765440

### Is the Third Team Member a member of IEEE?*

Yes

### Is the Third Team Member a Student?

Yes

### Is there a fourth member of the team?*

Yes

## *Declarations*

### Please indicate if someone from the project team completed the EPICS in IEEE Training Course

Please confirm if someone from the project team completed our training course. Please add their name and email. EPICS in IEEE encourages all teams to review our training course before submitting their proposal. The course can be found here: https://epics.ieee.org/resources/

Alifa Zalsa Bila (2412501724@student.budiluhur.ac.id)

## Artificial Intelligence (AI) Disclosure:*

AI technology is becoming more prevalent in the project proposals received by EPICS in IEEE. When used for limited purposes this is acceptable to EPICS in IEEE. However, writing a full proposal through an AI tool may not score well on the EPICS in IEEE Rubric. Please review our AI Resource Guidelines for more information.

Please disclose whether any artificial intelligence (AI) or machine learning tools were used in the drafting or preparation of the documents submitted as part of your application. This includes, but is not limited to, the use of AI-powered writing assistance tools, content generation algorithms, or similar technologies (for example, ChatGPT, etc.). This does not apply to the use of basic tools for checking grammar or spelling errors.

Yes, AI tools were used in drafting some or all of my application documents.

## Disclosure Statement:

If AI was utilized in any capacity during the creation of your application documents, please provide a brief description of the tools or technologies used and how, including the sections in which it was used.

We used AI tools, more particularly language translation aid (such as ChatGPT), in order to facilitate translating portions of our proposal from Bahasa Indonesia to English. Such assistance was employed primarily during writing sections including the Problem Statement, Project Description, Project Impact, and Student Learning Outcomes to ensure clear and professional text with the purpose maintained as provided in our work.

## Where did you hear about EPICS in IEEE?*

We were first introduced to the EPICS program in IEEE by our academic advisor, Mr. Dion Setiawan, S.T., M.T., a lecturer at the Faculty of Engineering, Budi Luhur University. Recognizing that the objectives of EPICS align closely with our own aspirations, we have developed a strong interest and motivation to actively participate in the program.

## Add me to the EPICS in IEEE Listserv for future communications about the program.*

Yes

## I agree to the IEEE Privacy Policy*

I agree to the IEEE Privacy Policy

I AGREE

**Declaration, Certification and Authorization**

**By submitting this Grant Application to EPICS in IEEE, I agree that if I am awarded a grant I will submit progress reports every 3 months on technical plans/progress, financial information, student demographics and outcomes, as required.**

## Declaration*

Please check the box below if you accept the agreement.

I AGREE

# File Attachment Summary

## *Applicant File Uploads*

- project budgetv1.pdf
- System Diagram.pdf
- Support Letter .jpg

| No | List and Group ALL Project Expenses | Price |
|---|---|---|
| | **Electronics & Control System (IoT System)** | |
| 1 | Rassbery Pi 5 | $ 307.09 |
| 2 | MQ-2 MQ2 Sensor Gas LPG | $ 186.66 |
| 3 | Loadcell 50 kg | $ 114.41 |
| 4 | Relay | $ 210.75 |
| 5 | Solar panel outboard temperature sensor | $ 102.23 |
| 6 | Cable, Cable Gland, Cable Ties, PMD 25x25 Cable Duct | $ 180.63 |
| 7 | FORT Electrical Panel Box (80x60x30 cm) | $ 117.42 |
| 8 | Internet router | $ 279.10 |
| 9 | Installation Cost | $ 36.19 |
| | **Solar Energy System (Renewable Energy Source)** | |
| 10 | Solar Panel 12V 450Watt Power | $ 246.88 |
| 11 | SOLAR PANEL CHARGER CONTROLLER SCC PANEL SURYA 10A 12V 24V | $ 166.23 |
| 12 | Yuasa Battery Pafecta 95D31R 12V 80Ah | $ 186.66 |
| | **Pyrolysis Unit (Thermal Processing System)** | |
| 13 | Gas lpg 3kg | $ 83.14 |
| 14 | SUS304 Stainless Steel Plate (100x110 cm) | $ 1,088.15 |
| 15 | 1” Stainless Steel Pipe (1.5 mm thickness) | $ 486.66 |
| 16 | 1” Brass Gate Valve | $ 176.45 |
| 17 | 600°C Thermometer | $ 252.79 |
| 18 | Long angle iron 30x30x3mm, Iron elbow, Iron hollow | $ 601.94 |
| 19 | Welding Machine, Welding Electrodes, Welding Wire | $ 535.89 |
| 20 | Gloves | $ 129.19 |
| 21 | Assembly Costs | $ 36.19 |
| | **Safety & Security** | |
| 22 | Fire extinguisher | $ 222.79 |
| | **Community Engagement & Education** | |
| 23 | Booklet Development, Community Outreach, and Publicity | $ 363.23 |
| 24 | Documentation supports, educates locals and promotions | $ 184.30 |
| | **Total Project Expenses** | ***$ 6,294.97*** |

# IoT-Driven Pyrolysis and Solar PV (rendered from Solidworks)

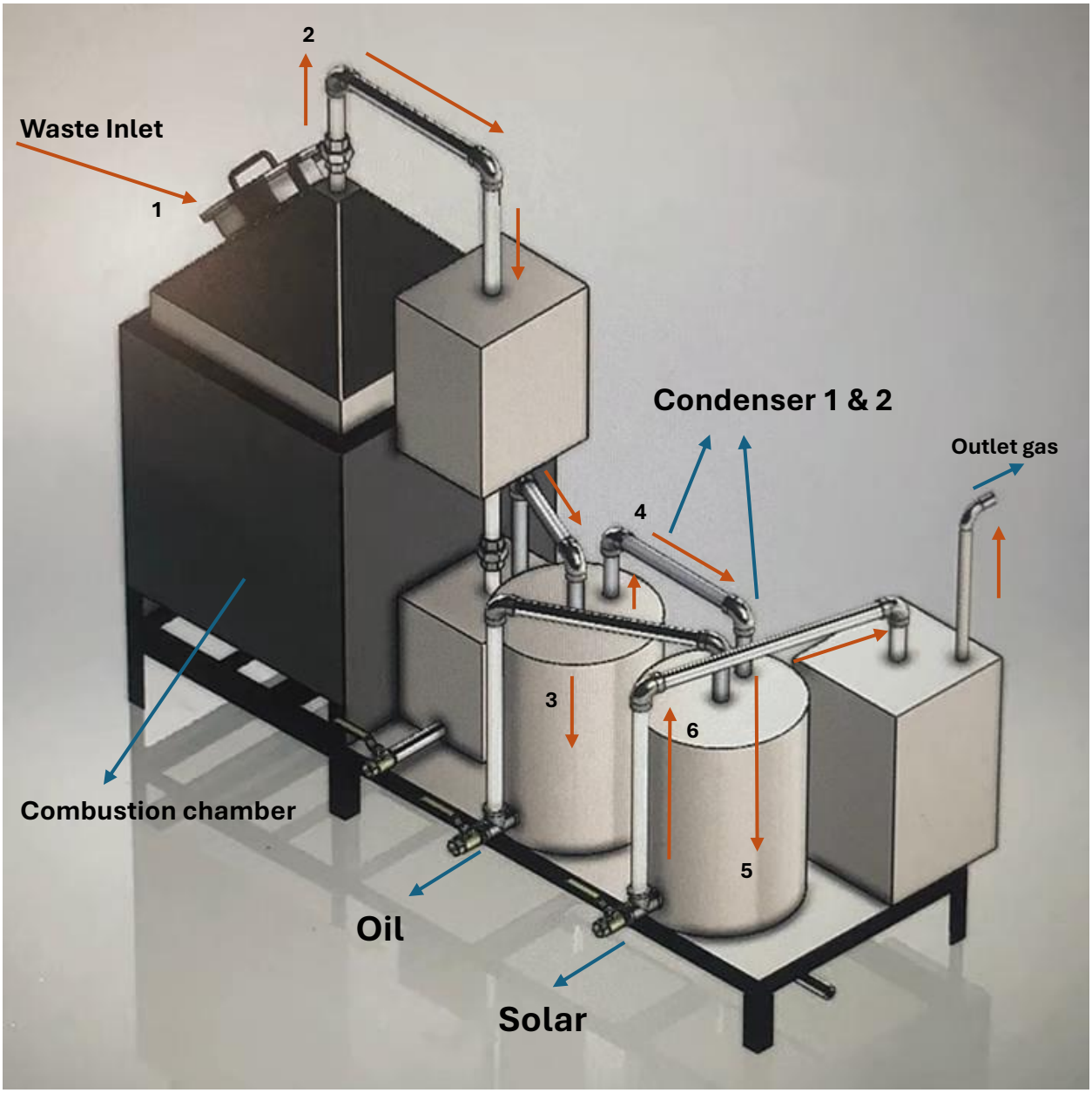



Figure 1. System Diagram

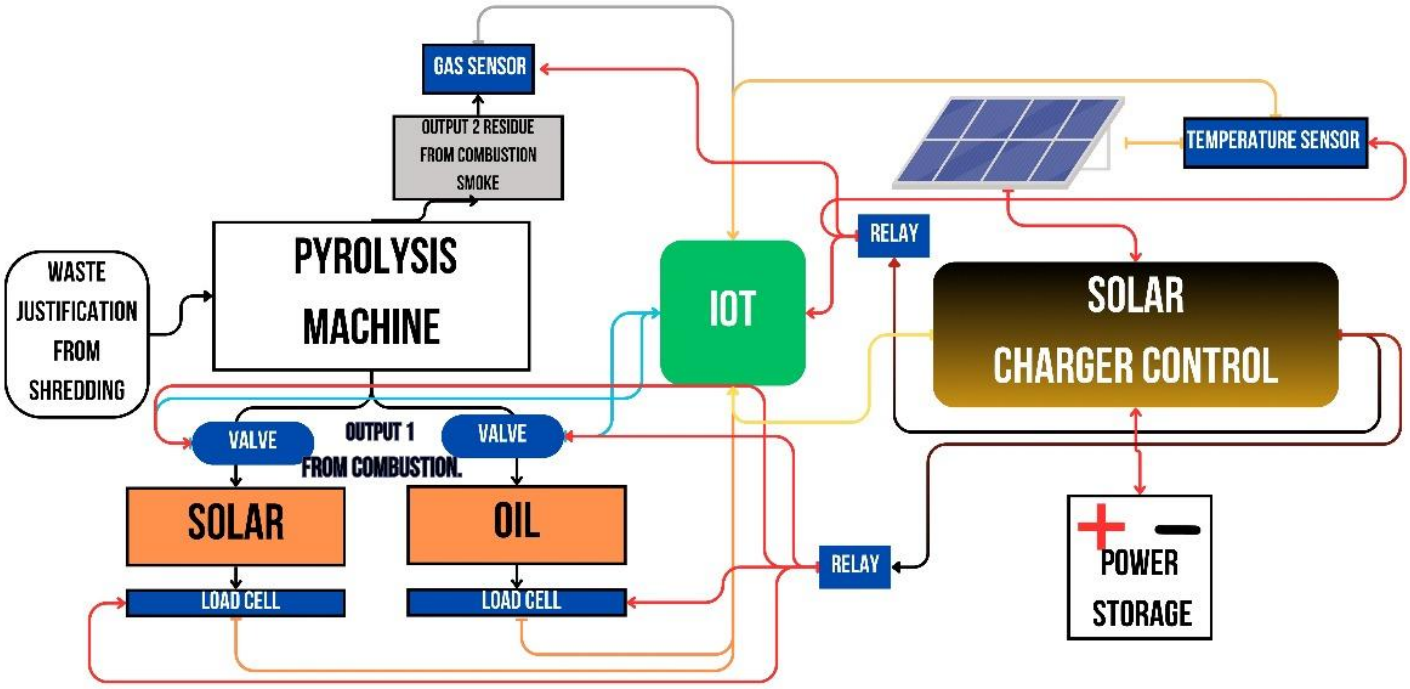
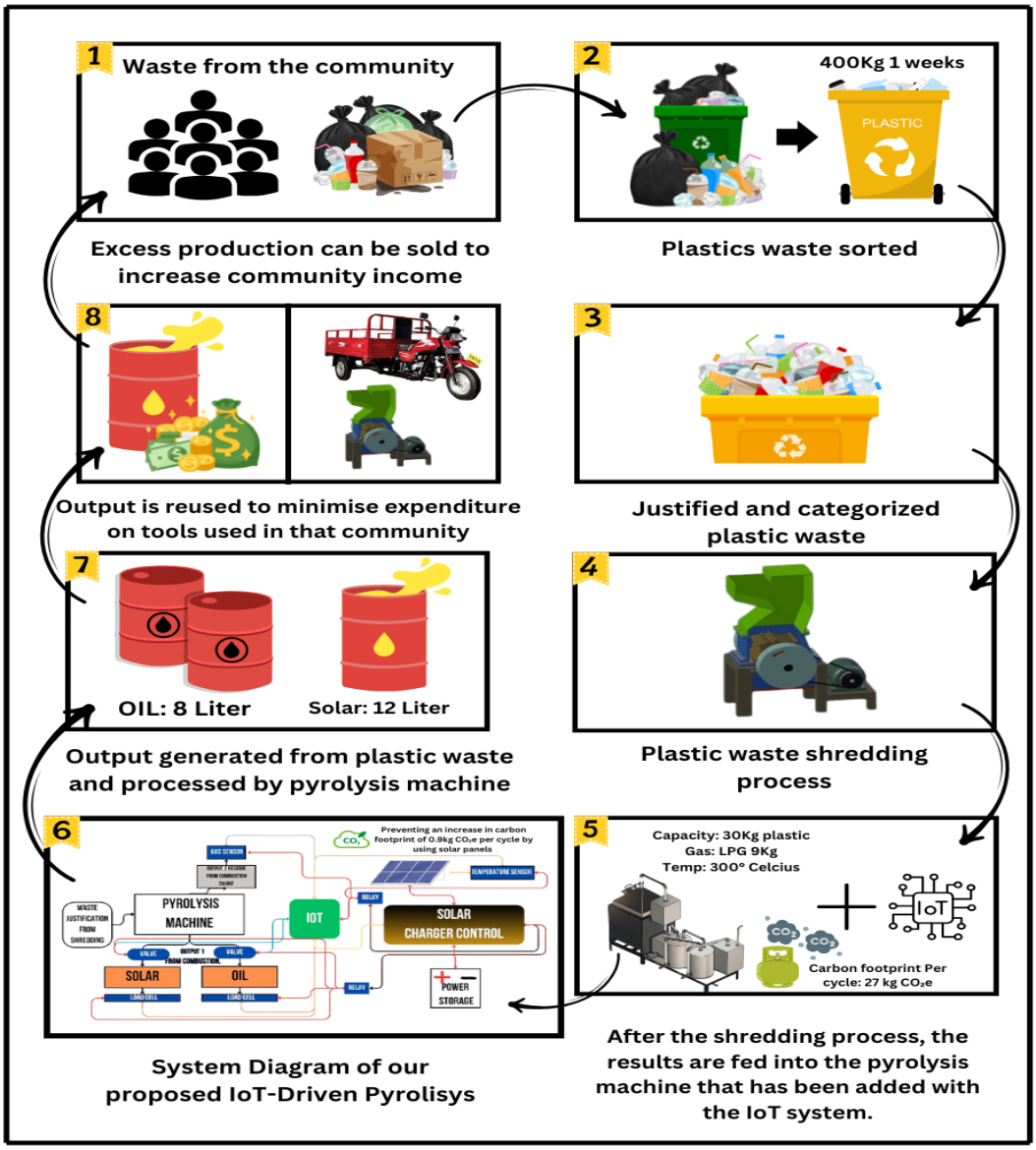



Figure 2. Pyrolisys, IoT and PV power diagram




| Energy Inputs | Energy Outputs |
|---|---|
| Capacity: 30Kg plastic<br>Gas: LPG 9Kg<br>Temp: 300° Celcius | OIL: 8 Liter<br>Solar: 12 Liter |

Figure 3. Abstraction of our project's positioning

**BANK SAMPAH DARLING**
**KELURAHAN SUDIMARA JAYA**
Alamat: Jl. Janur Kuning 2 No. 56 RT.04/RW.11 Kampung Darling,
Kelurahan Sudimara Jaya, Kecamatan Ciledug, Kota Tangerang

**Support Letter**

Project Collaborator – EPICS in IEEE

| | |
|---|---|
| Name | : Sobirin |
| Position | : Head of Bank Sampah Darling |
| Organization | : Bank Sampah Darling |
| Address | : Jl. Janur Kuning 2 No. 56 RT.04/RW.11 Kampung Darling, Kelurahan Sudimara Jaya, Kecamatan Ciledug, Kota Tangerang, 15151, Banten, Indonesia. |

Hereby providing full support for the implementation of the EPICS in IEEE Project 2025 carried out by:

| | |
|---|---|
| Project Leader | : Safitri Juanita |
| Position | : Institut Teknologi Sepuluh Nopember – IEEE Indonesian Section |
| Project | : CERIE: Ciledug's Environmental Recycling Initiative Empowered by IoT-Driven Pyrolysis for Community Waste Banks |

We are willing to participate in all stages of the design, implementation, and sustainability of the EPICS in IEEE Project. This letter of support is issued truthfully and intended to be used appropriately.

Jakarta, April 30th, 2025

Collaborator

(Sobirin)

Project Leader

(Safitri Juanita)