ITS

Innovative Products

2021

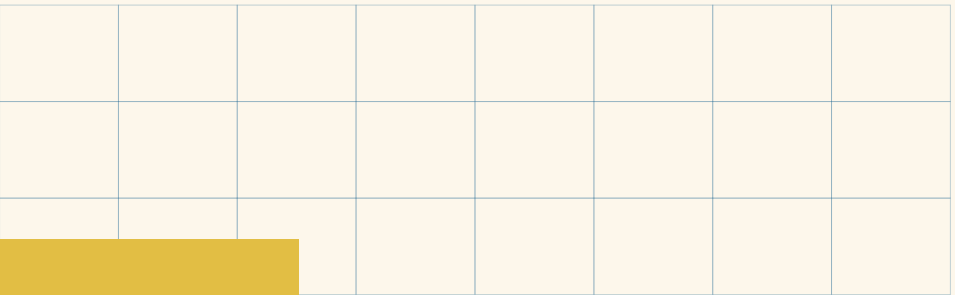
CONTENT

Covid-19, Digital Health

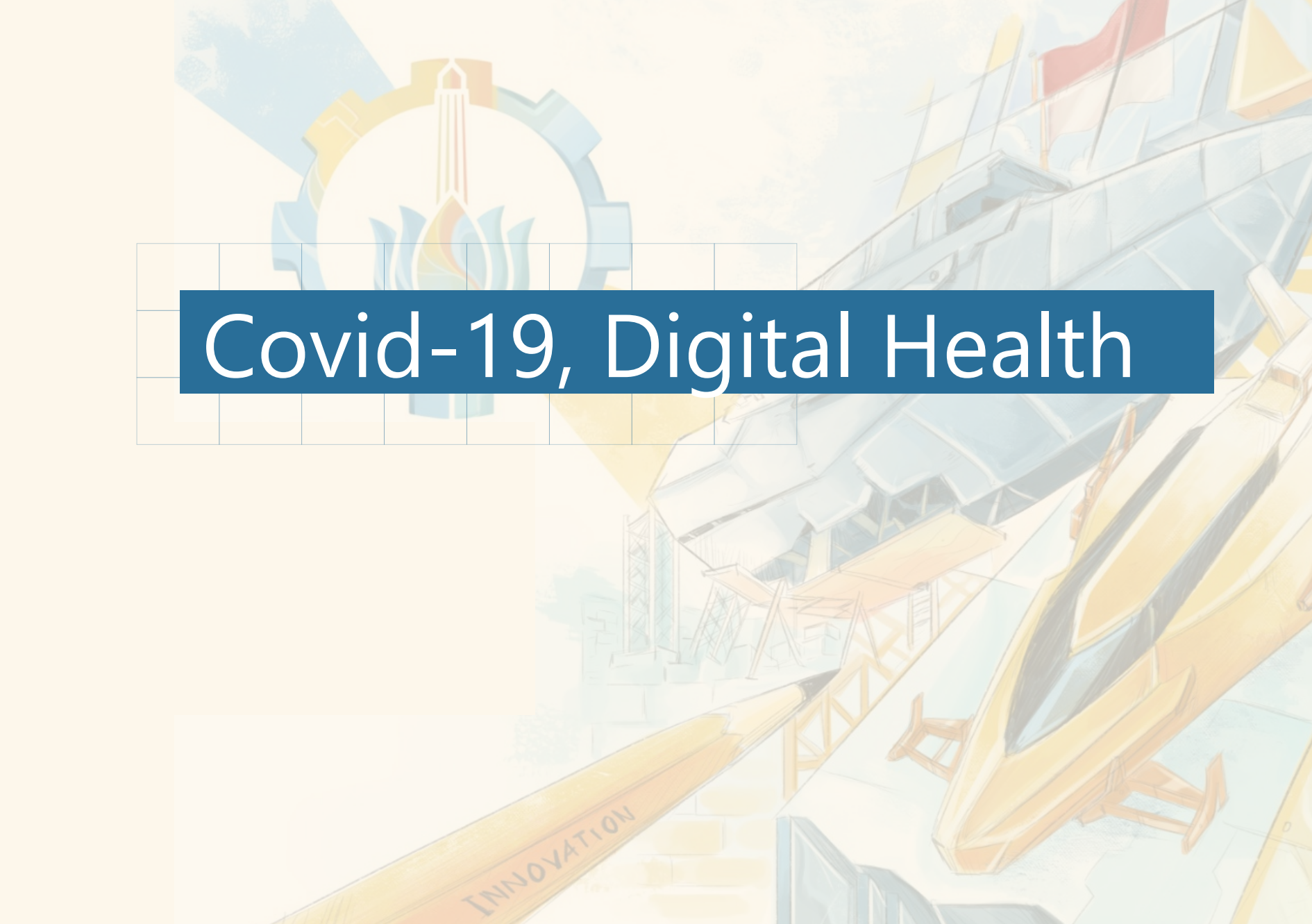
Maritime

Transportation and Robotic

Defence and Reuseable Energy



Covid-19, Digital Health



Raisa
Inosec19
EVITS
OXITS
Portable Hospital
WISH ITS
Implant Cranioplasty
Mixed Reality for Brain Surgery (MroBAS)
ITS Djamoe (Menitemu & Hoilits)
Co Film+

ITS
Innovative Products
2021

RAISA

01

01

RAISA

Robot Medical Assistant ITS – Unair **(RAISA)** helps health workers deal with COVID-19 patients. In order to minimize the contact between the medical personnel with Covid-19 patients and reduce the use of personal protective equipment (APD) which is increasingly thinning.

in order to minimize the contact between the medical personnel with Covid-19 patients and reduce the use of personal protective equipment (APD) which is increasingly thinning, Institut Teknologi Sepuluh Nopember (ITS) collaborated with Airlangga University (Unair) officially launched a Robot medical Assistant ITS-Airlangga (RAISA). The servant robot for Covid-19 patients was also handed over to the Airlangga University Hospital (RSUA) at ITS Robotics Center Building

The rector of ITS Prof. Dr. Ir Mochamad Ashari MEng revealed, the project has been conducted along with Unair and the government of East Java province (Pemprov Jatim) to solve one of the problems caused by the Coronavirus pandemic or Covid-19. “Today we hope that the contributions given can provide benefits to both the medical personnel and the public,” he said with enthusiasm.

The rector who is familiarly called Ashari explained that RAISA has been designed by professionals and ITS robotic team that has won various competitions in foreign countries. “By hiring medical people from RSUA, the more complementary features to the robot that the patient will need,” said the lecturer of Departement of Electrical Engineering ITS

Benefit

- Minimize the transmission of Covid-19 to medical personnel
- Helping patients to communicate in 2 directions (Audio & Video)

Fitur

- Remotely controlled using Joystick
- Omnivision for better control
- 4 shelves to carry food, medicine, etc
- Able to lift a total weight of 50 kg
- Can be applied to ICU (surveillance)
- Equipped with advanced sensors for environmental recognition

Specification

Dimensions (LxWxH): 50 cm x 50 cm x 160 cm
Weight: 50 kg
Number of shelves: 4 pieces
Distance between shelves: 27 cm
Battery capacity: 0.85 kWh (10 hours)

Welcoming the greeting delivered by Ashari, President Director of RSUA Prof Dr. Nasronudin SpPD-KPTI FINASIM also gave appreciation for the results of cooperation. He revealed that medical personnel in Unair need a technology application from ITS. "The Robot can provide services to patients who are being isolated such as delivering food, clothing, or medicines," he said.

The Doctor who is familiarly called Nasron is adding, even with this robot, the patient also still need a nurse, but at least the intensity of the interaction is reduced. "The need for heart touching act and direct interaction is needed to support the psychology of Covid patients themselves," said this 63 years old Doctor.

Giving another point of view, the Chairman of the Board of Trustees (MWA) ITS Prof Mohammad Nuh explained, many values exist in RAISA. Especially the value of humanity, because nurses or medical personnel who usually have to interact with the patient can already be replaced with robots. "So that with this robot, medical personnel can have more energy and reduce the occurrence of transmission," he said.

The former Mendikbud added economic value can also be obtained because if ordering robots from abroad the fee will only give benefit for them (producers abroad). Therefore, ITS and Unair believe can make this so that it will produce greater economic value. "Also the value of togetherness, with Governor of East Java, ITS, and Unair together reduce the spread of SARS-Cov-2," said the professor who familiarly called Nuh.

In a robot demo that cost Rp 100 million per unit, Vice Governor of East Java Province Dr. Emil Elestianto Dardak feels the sophistication and conduct trials directly to this robot. "This RAISA is interesting, besides the appearance of its cute interface, it can also connect patients with the nurses through the screen," said Emil satisfied.

The Jakarta-born man expects the RAISA robot to expedited its production when it is well-operated in RSUA, expected to be operated in massive production soon. “Because we (government of East Java province, red) already prepared funds from APBD especially to develop research and technology,” he said.

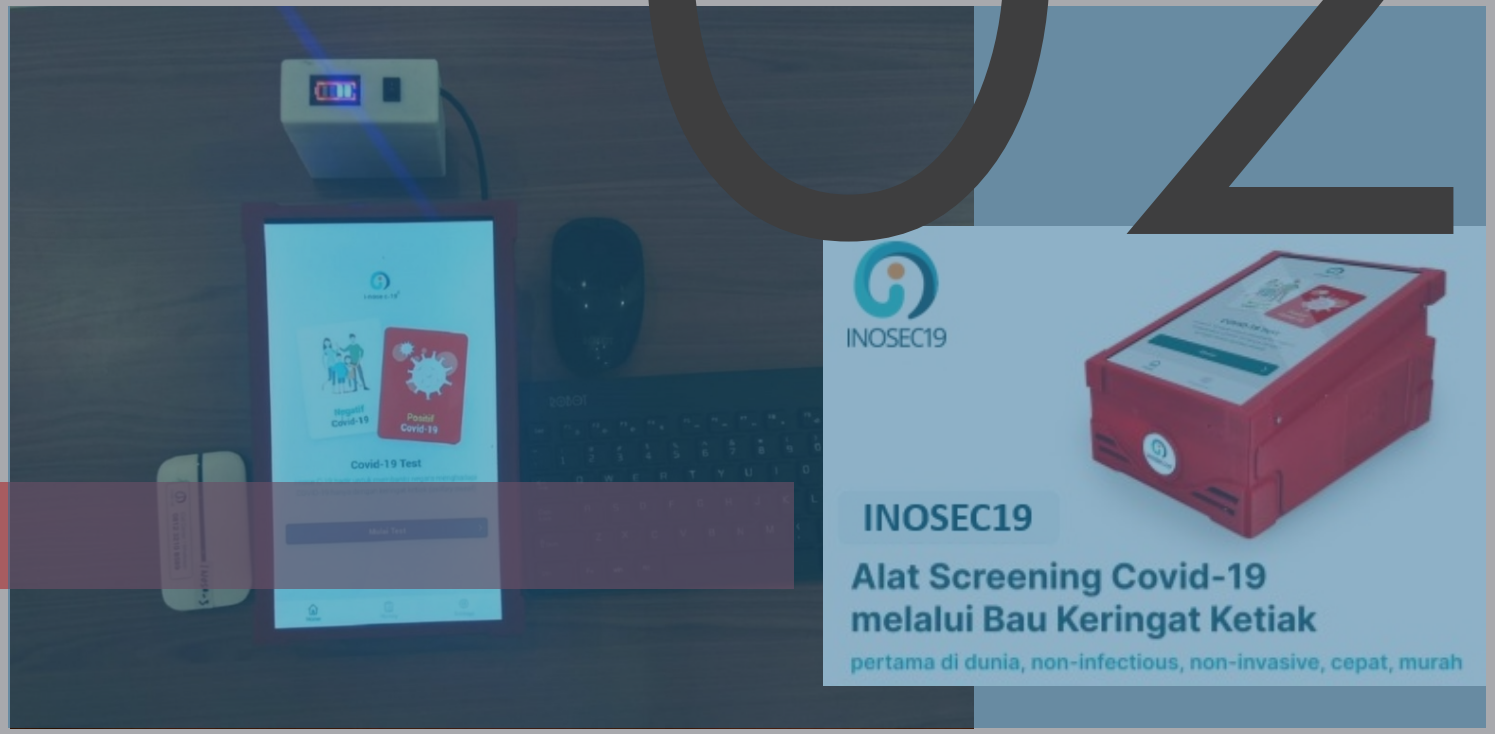
Meanwhile, Muhtadin ST MT, one of the robot research teams from ITS explained, if this robot can operate depending on the connection of Wireless Fidelity (Wifi) and with the battery specification 0.85 kWh RAISA Estimated to be able to serve for about 8-10 hours. “Trials have also been conducted, to keep this sterile can be done using a disinfectant,” said this lecturer of Departement of Computer Engineering.

This RAISA is controlled remotely with a joystick. The robot is a combination of technology that existed in ITS previous four robots, a wheeled football robot (Iris), an unmanned ship robot (Barunastra), a humanoid robot (Ichiro) and a robot for the Indonesian Robot Contest (KRI). The 1.5-meter-tall Robot comes with four stacked shelves that can carry a lot of goods up to 50 kilograms. It also features a monitor for two-way communication between the medical personnel and the patient using multimedia.

RAISA has been designed by reliable people and the ITS robot team that has won various competitions abroad. "By cooperating with medical people from RSUA, it will further complete the features on the robot that patients will need later,"

02

Inosec19


Covid-19 Test
INOSEC19
INOSEC19
Alat Screening Covid-19
melalui Bau Keringat Ketiak
pertama di dunia, non-infectious, non-invasive, cepat, murah

02

Inosec19

The i-nosec-19 is the world's first Covid-19 screening tool to detect axillary sweat odor. I-nosec-19 works by taking a sample of the odor of someone's underarm sweat and processing it using artificial intelligence (AI).

INOSEC19

INOSEC19

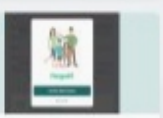
Alat Screening Covid-19 melalui Bau Keringat Ketiak

pertama di dunia, non-infectious, non-invasive, cepat, murah

Principal Inventor
Prof. Drs.Ec Ir. Riyanarto Sarno, M.Sc., Ph.D.

Email
riyanarto@if.its.ac.id

Cara kerja INOSEC19

1. 
   Letakkan selang ke ketiak
2. 
   INOSEC19 menghisap gas Volatile Organic Compound (VOC) dari keringat ketiak seseorang
3. 
   Gas VOC yang didapat, diubah menjadi signal listrik, diolah dengan *artificial intelligence*
4. 
   Hasil screening muncul
5. 
   Sertifikat hasil screening otomatis terkirim via Whatsapp
6. 
   Verifikasi keaslian sertifikat melalui inose.id

Keunggulan INOSEC19

Axillary Sweat Non-Infectious

Axillary Sweat atau Keringat Ketiak *non-infectious*, berarti limbah maupun udara buangan INOSEC19 tidak mengandung virus COVID-19.

Dapat Terintegrasi Publik, Pasien, Dokter, Rumah Sakit, Laboratorium

INOSEC19 dapat terintegrasi publik, pasien, dokter, rumah sakit dan laboratorium.

Waktu Sampling Dan Proses Cepat

Waktu pengambilan sampel dan proses komputasi cepat, sekitar 3,5 menit.

Artificial Intelligence Untuk Screening

INOSEC19 berbasis Artificial Intelligence untuk screening positif negatif COVID- 19.

Sampling Dan Proses Dalam Satu Alat

INOSEC19 sangat praktis karena pengambilan sampel dan komputasi artificial intelligence dalam satu alat.

Hasil Screening Dapat Dikirim Ke Whatsapp

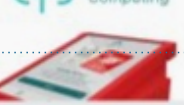
Sertifikat hasil screening dari INOSEC19 dapat dikirim melalui WhatsApp dan dilengkapi dengan QR-Code untuk mengetahui keaslian dari sertifikat.

NFC Untuk Mencatat Identitas

Terdapat NFC untuk mencatat id seseorang, membuat pengisian data lebih mudah dan cepat.

Data Terjamin Handal

Data terjamin handal karena disimpan di alat maupun cloud.



Didukung

AUN/SEED-Net JICA

Inosec19

03

E-VITS

Emergency Ventilator ITS

03

E-VITS

ITS continues to be involved in providing solutions in the midst of the Covid-19 pandemic. One of them is making a simple and low-cost mechanical ventilator innovation called **E-VITS.**

Simple and Low-Cost Mechanical Ventilator or Robot Ventilator currently staying through due diligence operated for 2×24 hours nonstop. The ventilator features Respiration Rate, Inspiration/Expiration Ratio, Tidal Volume, PEEP (Positive End-Expiratory Pressure), and PIP (Peak Inspiration Pressure) settings.

EVITS serving for healthcare → EVIA serving for healthcare

BPFK is an institution under the auspices of the Indonesian Ministry of Health with the task of carrying out maintenance and calibration on medical equipment used by health service facilities in Indonesia. This effort is to guarantee an accurate and precise performance (highly accurate and precise measurements) of medical equipment. To carry out their duties, BPFK is equipped with various measuring instruments with qualifications as calibrators of various physical parameters to ensure the accuracy of the performance of the medical equipment tested.

In this Covid-19 pandemic situation, BPFK was given the additional task of conducting technical feasibility testing of various types of medical equipment prototypes that were developed to assist the management of patients infected with Covid-19. This includes testing the function and usage of a ventilator prototype, a medical device used as a breathing aid for Covid-19 patients.

Therefore, since May 5, tests on E-VITS have been processed to ensure that the ventilator system developed by ITS meets the performance parameters required by BPFK. On this occasion, Deputy Governor of East Java, Dr. Emil Dardak, also joined in the handover of E-VITS by the Ventilator Team of the ITS Physics Engineering Department in the context of submitting the prototype to BPFK for feasibility and technical safety test.

Development of the E-VITS Prototype

Head of the Ventilator Team of the Department of Physics Engineering, Dr. rer. nat. Ir. Aulia Muhammad Taufiq Nasution, M.Sc., conveyed that the E-VITS ventilator prototype submitted for testing has previously undergone development from the initial version that was launched on 7 April. "The initial version refers to proof-of-concept, which is proof of the prototype's ability to demonstrate in fulfilling all aspects of performance parameters needed in clinical applications for Covid-19 patients," he elaborated.

This lecturer who is familiarly called Olly, explained that after the initial version, the development of the ventilator prototype was also carried out with more emphasis on improving the operational resilience of the system. “Some improvements were made in order to achieve the stability and accuracy of the performance given by the E-VITS ventilator,” added this ITS Physics Engineering Department lecturer.

Olly and the team worked hard to make improvements so that the E-VITS will be able to perform in accordance to the five requirements of BPFK, namely electrical safety testing; visual test; endurance test; performance test; and the availability of documentation related to the technical, operational, and maintenance of the ventilator. “For this reason, before being submitted to BPFK, we have also carried out an internal inspection to make sure that the E-VITS have fulfilled every point in the relevant requirements,” he revealed.

One important point out of those five requirements is the tenacity of the tool. In this case, the ventilator has been tested using a tool for 2×24 hours without stopping to monitor whether the ventilator system is able to produce a stable performance in accordance with standard provisions. “The system is declared as stable if it remains to be accurate and precise in terms of performance,” explained this bespectacled lecturer.

Fitur E-VITS

1. 2 Modes of Operation: Pressure Control & Volume Control *(switchable)*
2. PIP *(adjustable)*: 0 – 30 cmH_2O
3. PEEP : 5cmH2O (PEEP valve)
4. Respiratory Rate *(adjustable)*: 10 – 25 *breaths-rate-per-minute (bpm)*
5. I:E ratio *(adjustable)*: 1:1 – 5
6. Tidal Volume, adjustable: 0 – 500 mL
7. FiO2 (50% - 100%, calibrated O_2 mixer)
8. Internal battery (2 hours), plus 4 backup battery (≈ 4 x 2 hours)

As a reference, variations in the value (variability) of accuracy and precision during tool testing for 2×24 hours must be no more than a range of 5 percent. If more than this value, the device tested is no longer being controlled. "For that reason, E-VITS is equipped with controllers on all sensors (which have been calibrated) and actuators, so as to produce the expected variability," explained this doctor who is a graduate of the University of Göttingen.

The BPFK test results indicate that the E-VITS ventilator has satisfactory performance with all aspects of performance and safety being met. He continued that BPFK provides a record of minor improvements to prepare E-VITS in the clinical testing phase related to the dimensions and improvement of labeling quality for various indicators on the E-VITS casing. "We have consulted with BPFK that the display of E-VITS will be designed slimmer than it is now," he concluded.

Fitur E-VIA

Standard Compliance Produk

ISO 80601-2-12:2020
Medical electrical equipment — Part 2-12: Particular requirements for basic safety and essential performance of critical care ventilators

IEC 62353:2014
Medical electrical equipment - Recurrent test and test after repair of medical electrical equipment

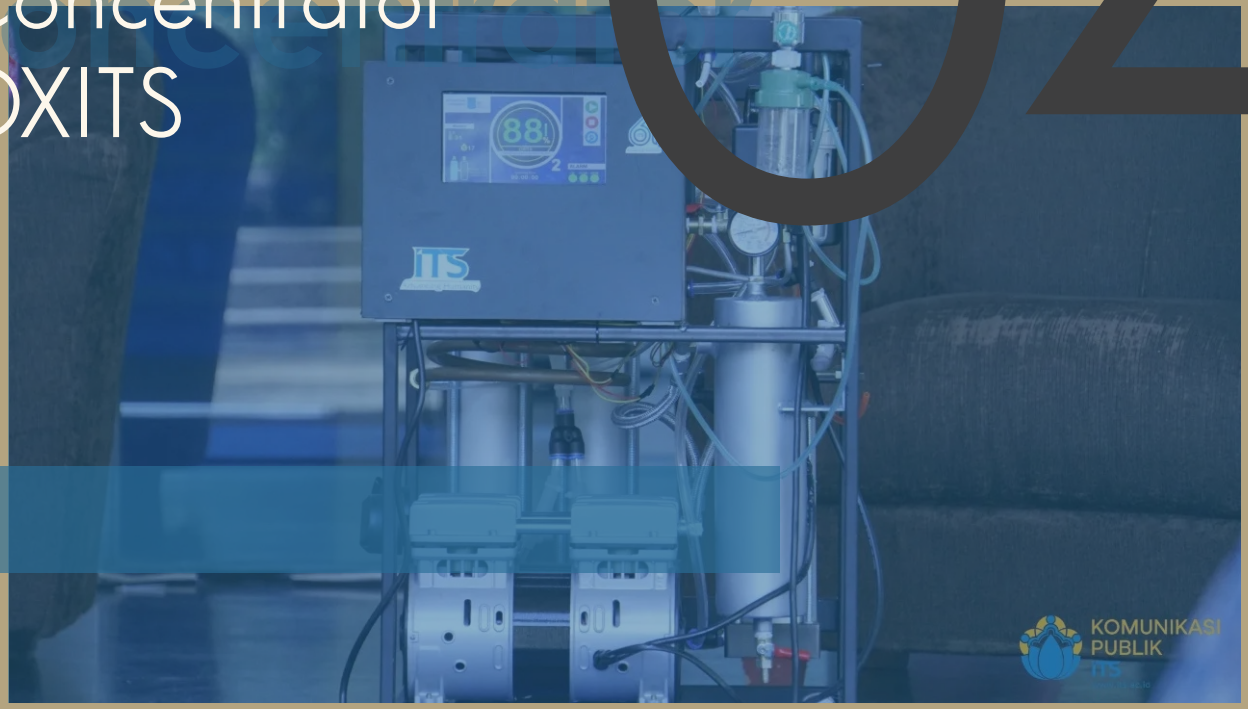
Spesifikasi Produk

Catu Daya	180 – 260 VAC, 47 – 63 Hz Konsumsi daya 50 Watt (Maksimum 100 Watt)
Dimensi	35x40x40 cm, Berat = 14 kg
Display	LCD Resisitive Touchscreen 7 Inch
Battery	7Ah, 12 Volt (Tipe VRLA) up to 5 hours.
Filter	Bacterial Filter & HME Filter
FiO2	50 – 90 % (pengaturan lewat regulator)
Selang Ventilasi	Single limb
Mode Ventilasi	1. Pressure Control (PCV) 2. Volume Control (VCV) 3. Assist Pressure Control (APCV) 4. Assist Volume Control (AVCV) 5. Pressure Support (PS)
Rentang Kinerja	• Respiration Rate: 10 - 30 BPM • Peak Inspiratory Pressure: 0 – 40 cmH2O • Tidal Volume: 250 – 500 mL • I : E Ratio 1:1 – 1:3 • Sensitivity Trigger -3 to +3 • PEEP : 5 – 10 cmH2O, adjustable via manual PEEP Valve

ventilators made by ITS have the advantage that the components used are cheap and easy to manufacture. If the price of ventilators in the market reaches Rp. 800 million, the ventilator made by ITS is only Rp. 75 million.

04

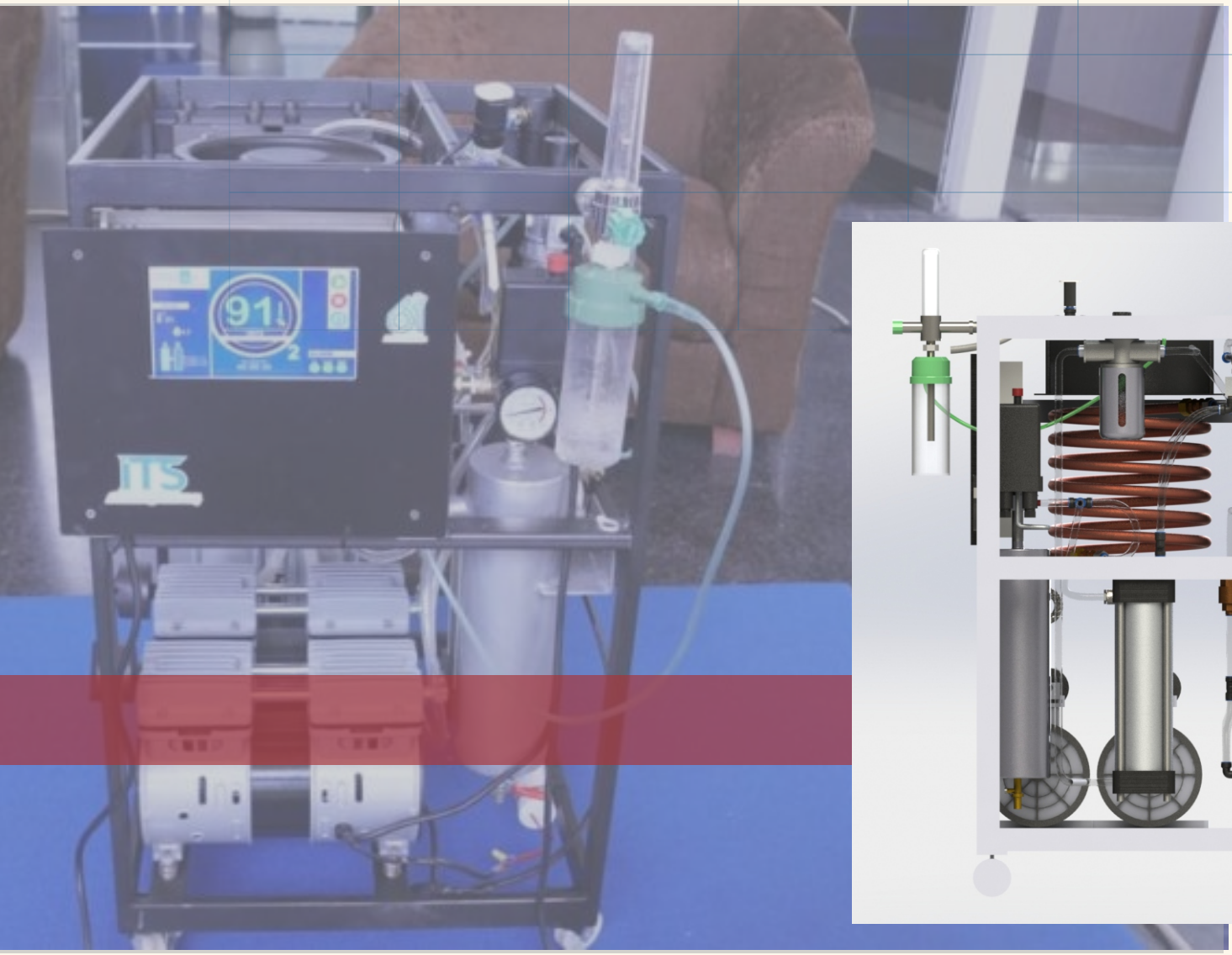
Oxygen Concentrator OXITS



04

Oxygen Concentrator

ITS Oxygen Concentrator (OXITS) can replace the role of oxygen cylinders that are needed by the community during the Covid-19 pandemic. OXITS can produce pure oxygen at a concentration of 93±3% or at least 90%. The working principle of OXITS is to take free air and purify it from nitrogen content through pressure swing adsorption (PSA) technology.


91
ITS


KOMUNIKASI
PUBLIK

Oxygen Concentrator versi alpha:

1. Kapasitas 5 LPM max
2. 02 purity 93%+ 3%
3. User friendly based Human Machine Interface (HMI)

Oxygen therapy is recommended for all severe and critical COVID-19 patients, with low doses from 1-2 L/min (LPM) in children starting at 5 L/min in adults with nasal cannula, moderate flow rate for use with the Venturi mask (6-10 LPM); or higher flow rates (10-14 LPM) using a mask with a collection bag. In addition, oxygen can be delivered at higher flow rates and in higher concentrations, using high-flow nasal cannula (HFNC) devices, non-invasive ventilation (NIV) and invasive ventilation devices.

An oxygen concentrator is an electrically powered self-contained medical device designed to concentrate oxygen from the ambient air. Utilizing a process known as pressure swing adsorption (PSA), oxygen concentrators produce up to 95.5% concentrated oxygen for later use by people who require medical oxygen due to low oxygen (saturation) levels in their blood.

OXITS can produce pure oxygen at a concentration of 93±3 percent or at least 90 percent. The head of the Sub-Directorate of Research and Scientific Publications of the Directorate of Research and Community Service (DRPM) of ITS explained that apart from oxygen, free air also contains about 78 percent nitrogen and the rest are other gases.

Portable Hospital

05

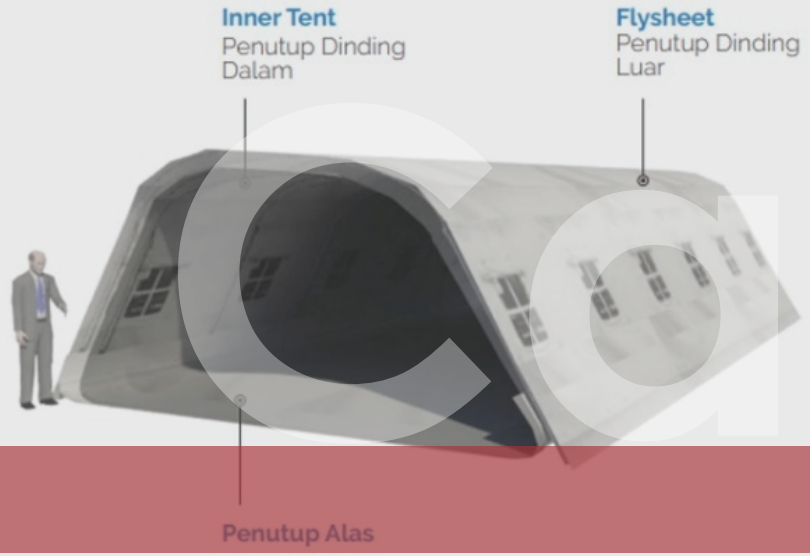
05

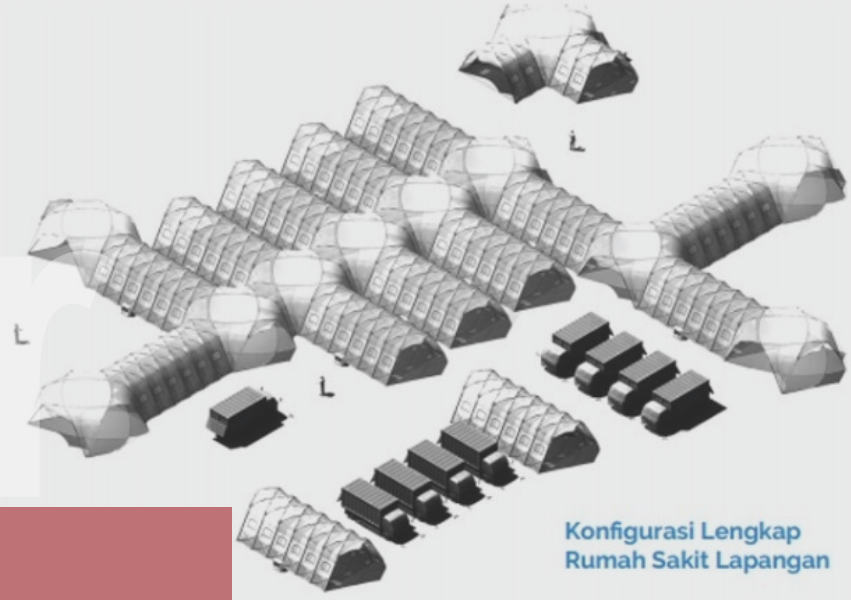
Portable Hospital

ITS seeks and actively participates in preventing and handling the Corona virus or COVID-19 through research activitiesand innovation. This time, ITS collaborated with Universitas Airlangga Hospital (RSUA) in creating three innovative tools, namely the Disinfection Chamber, Portable Hospital **(PORTAHOS),** and Portable Isolation Room which was officially launched at the ITS Robotics Center Building.

Portable Hospital consists of the main unit Container and Tent. Equipped with various facilities and infrastructure to operate effectively. This portahos isolation tent is the easiest variant to produce in Indonesia. Functioning as an isolation room for Covid 19 patients, this tent is equipped with a negative pressure air pressure system to prevent the virus from escaping into the outside air. Tent size L has 6 isolation rooms equipped with 2 anterooms in each tent. This variant is available in 3 sizes: Large (6x12m), Medium (6x9m), Small (6x6m). Extended Container Room is a space that is the result of innovation from steel containers / FRP containers. has a motor-driven mechanism system to widen the 2430 mm container to 4830 mm. Very suitable for deployment building, easy to move, installed in various fields. Multi purpose building consists of: Office, Dormitory, Resto, Cafe, Workshop, or medical installations in the field (Emergency Room, Operating Room, ICU, Medical Lab, Pharmacy, Radiology, Kitchen & Laundry). The interior is coated with XPS DOW isolated material with 2mm lamelux FRP sheet walls and as an insulation material so that it is semi-insulating and supports the use of Air Conditioner (AC) and Negative Pressure HEPA Filter

PORTAHOS (Portable Hospital)





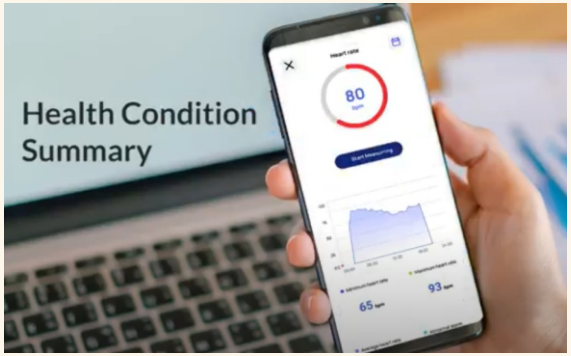
WISH ITS

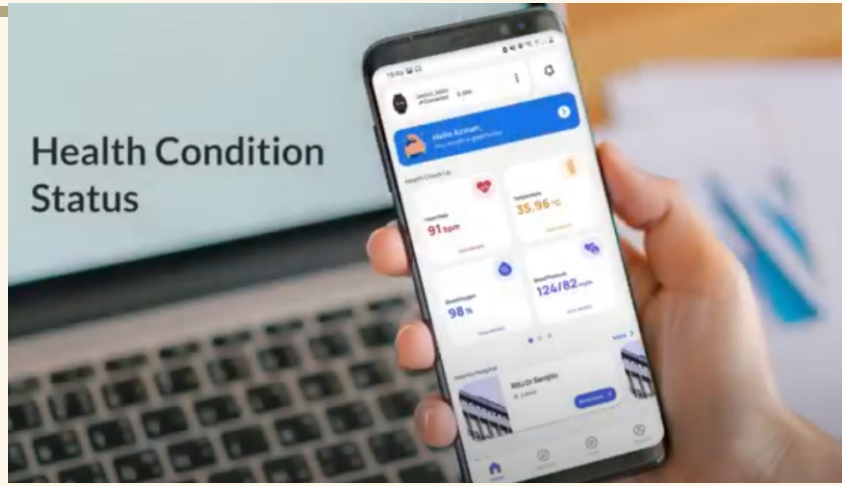
WISH ITS

06

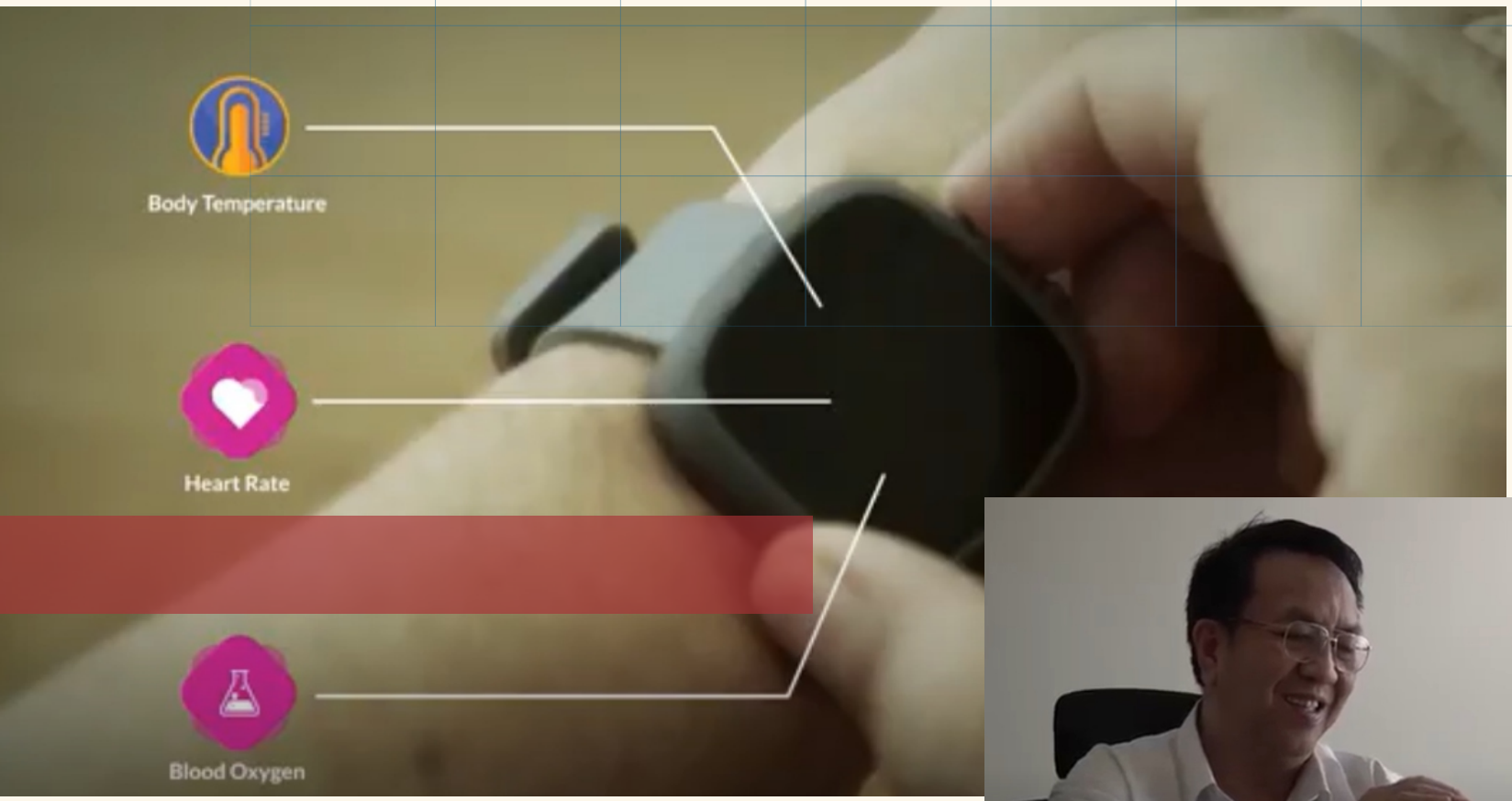
06

WISH ITS





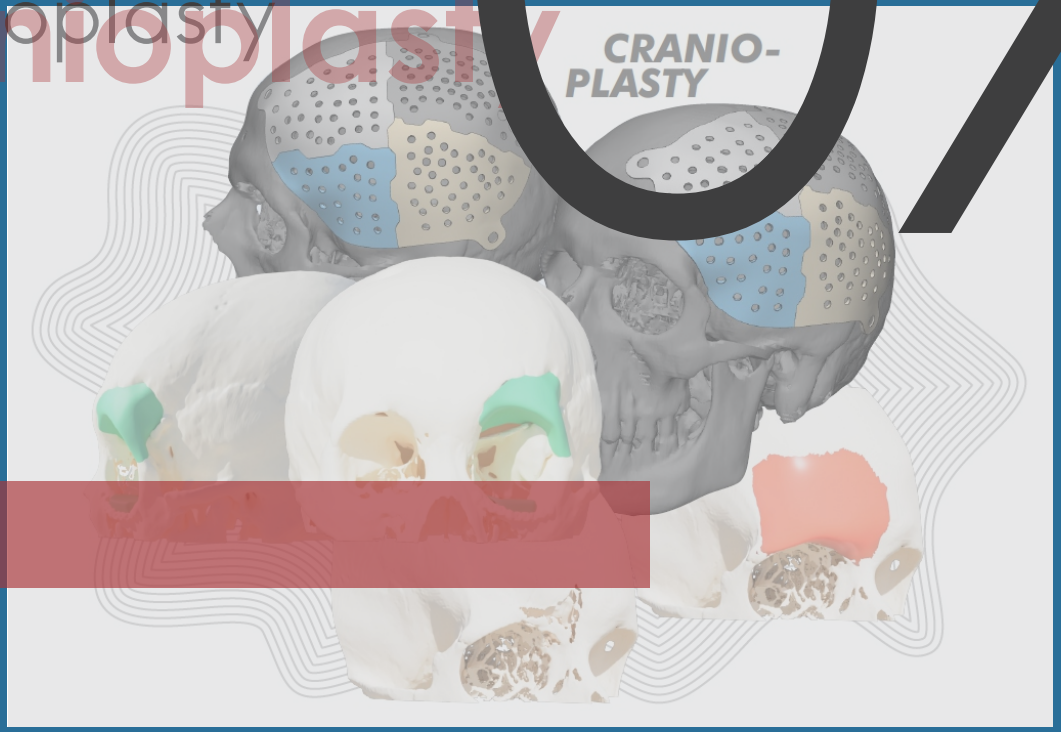
WISH ITS: Integrated Dashboard Management System (DEMITS) and Smart WIDYA Healthy Watch Monitor to Reduce Office Building Cluster Covid-19 Spread


Body Temperature
Heart Rate
Blood Oxygen


Med. Dashboard
Dashboard
Personal
Room Tracking
Employee
Departmant
Kadar Kolestrol 2020
Kadar Kolestrol 2020

07

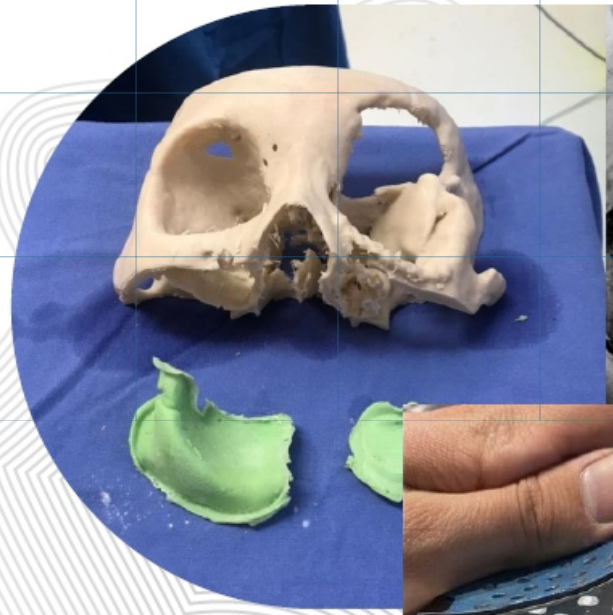
Implant cranioplasty

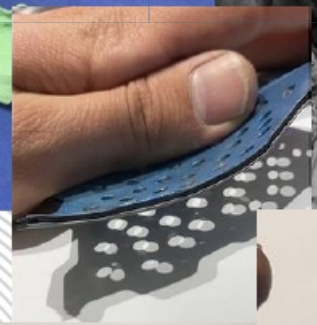


07

Implant Cranioplasty

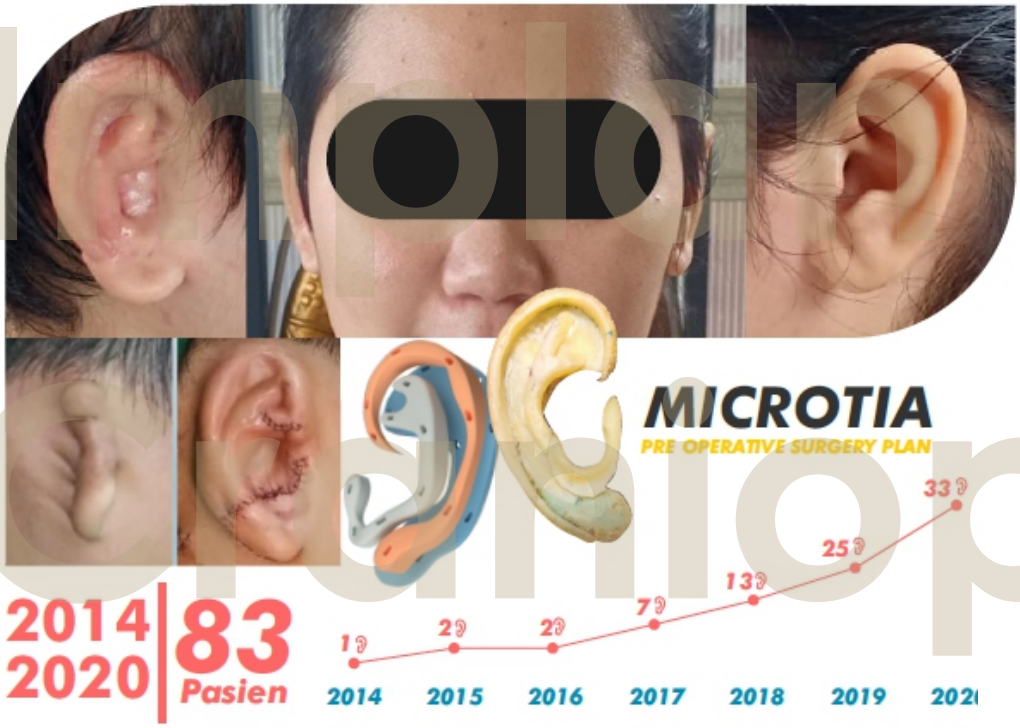
Integrated Digital Design based computer-aided design and manufacturing (CAD/CAM/CAE) technology today is the standard in the manufacturing industry. The purpose of this research center is to develop a workflow for 3D modeling and additive manufacturing (AM) of patient-specific medical implants and pre-operative surgery plan. The comprehensive workflow consists of four steps: medical imaging; 3D modeling; additive manufacturing; and clinical application. The proposed workflow obviates the manual procedure and can produce planning for surgical procedures before surgery, more accurate and cost-effective implants.






iDIG
RCMed
PUSAT INOVASI RUMAH SAKIT
UNIVERSITAS AIRLANGGA

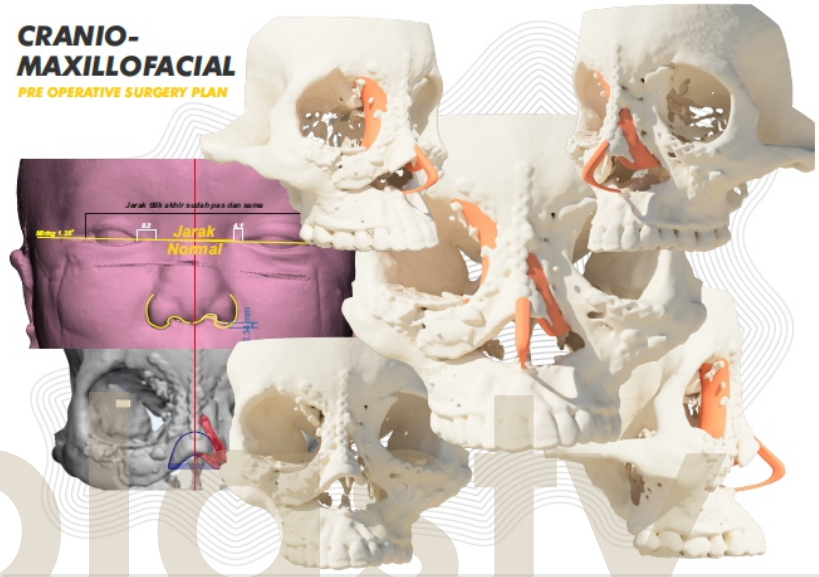

INTEGRATED DIGITAL DESIGN RESEARCH CENTER
(IDIG RCMED)
UNAIR HOSPITAL - ITS



MICROTIA

PRE OPERATIVE SURGERY PLAN

2014
2020
83
Pasien



CRANIO-MAXILLOFACIAL

PRE OPERATIVE SURGERY PLAN

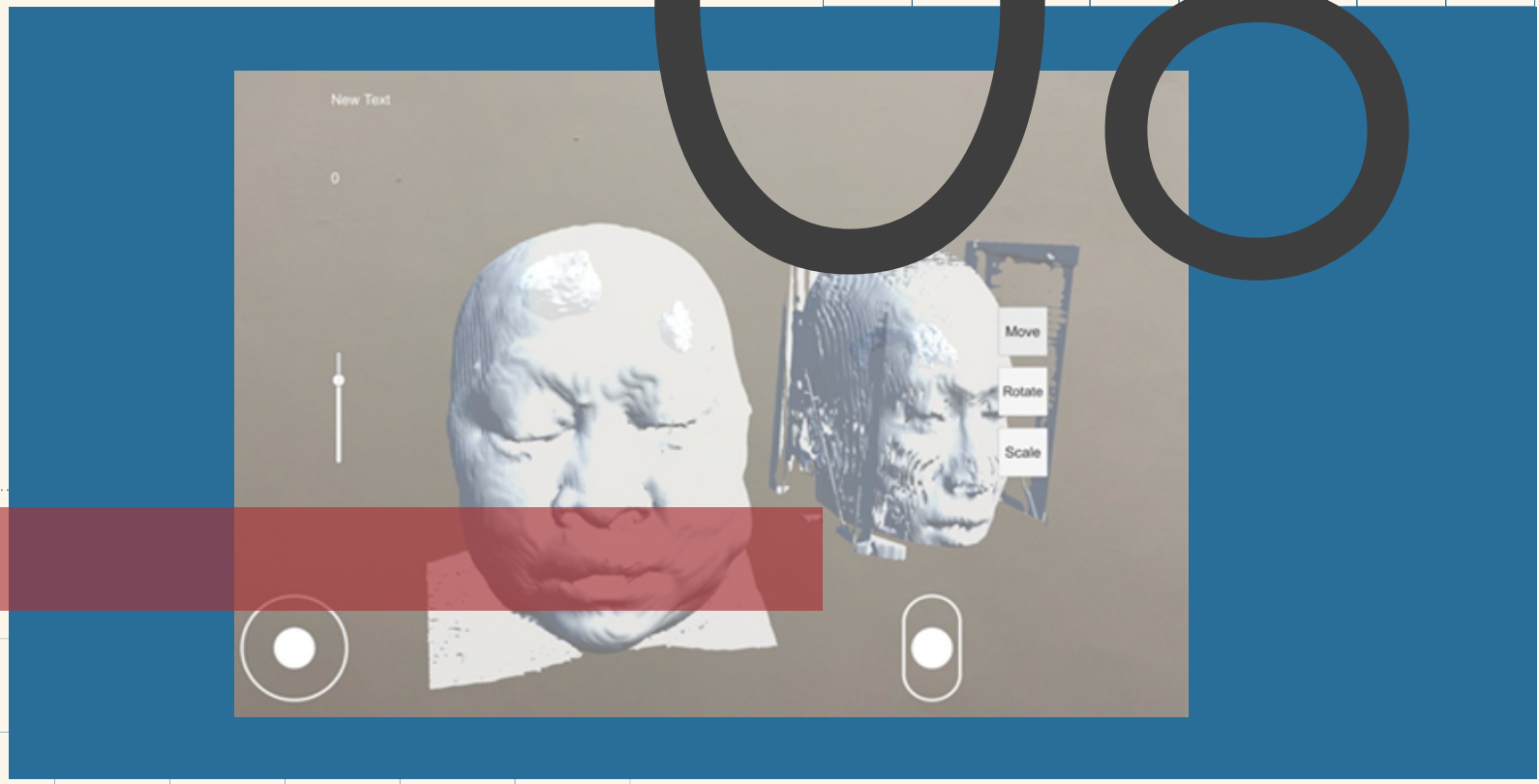
CRANIO-MAXILLOFACIAL

PRE OPERATIVE SURGERY PLAN

ITS
Innovative Products
2021

Mro BAS

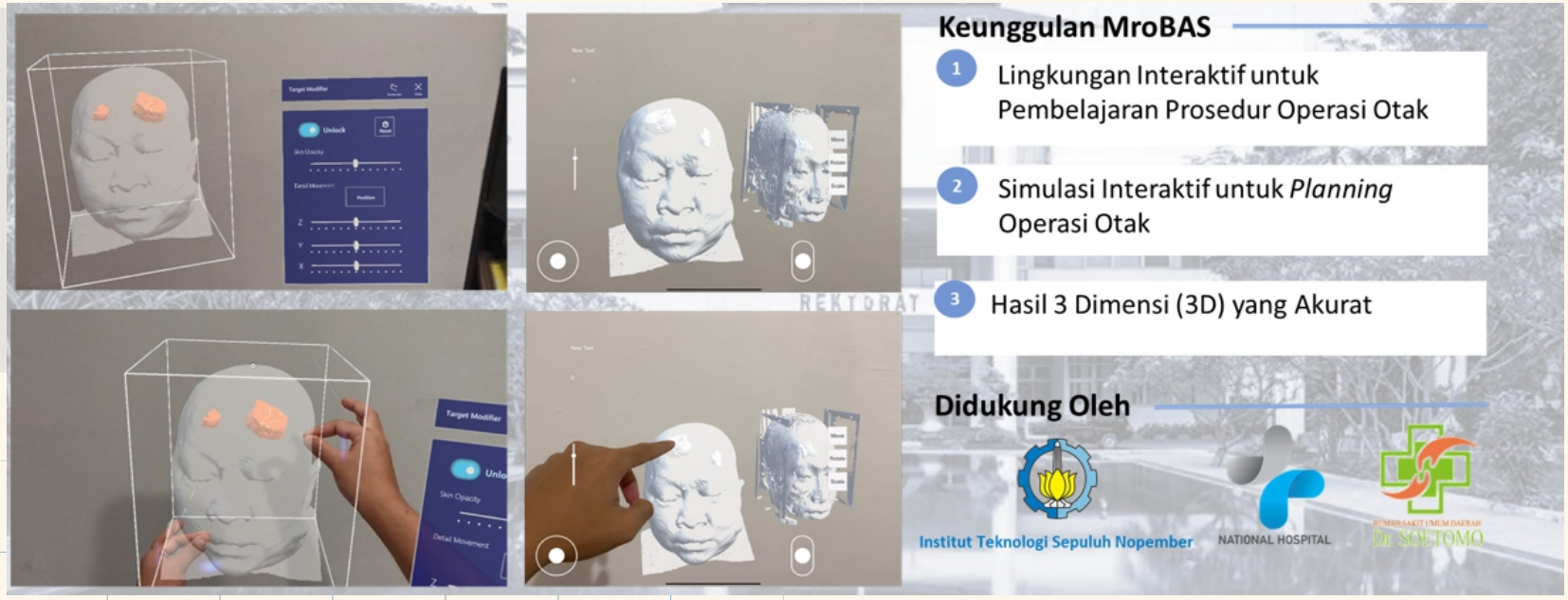
08



08

Mro BAS

Mixed Reality for Brain Surgery (MroBAS) is an interactive brain surgery simulation using mixed reality



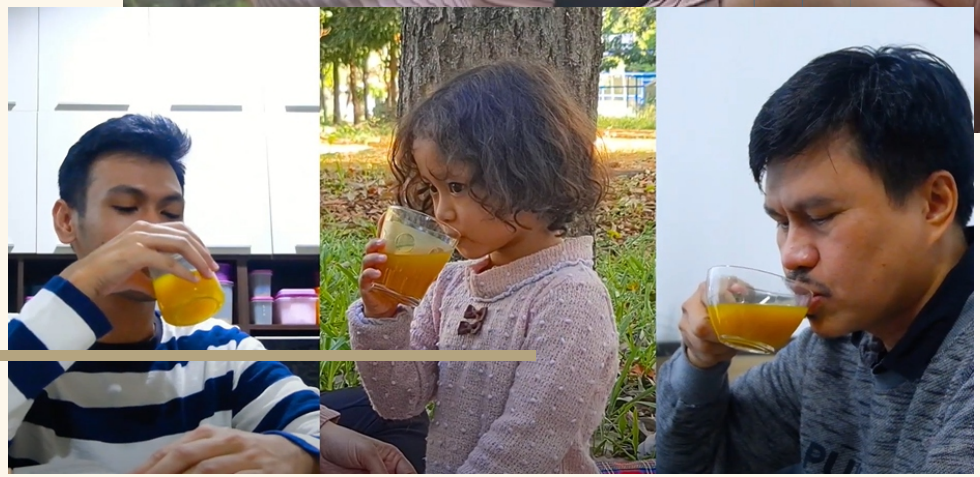
09

ITS Djamoe Menitemu

09

ITS Djamoe Menitemu

Menitemu is an herbal drink with 100 percent natural ingredients that are very beneficial for health




ESTD ITS 2020
DJAMOE
menitemu
ITS
DJAMOE
menitemu
MENIRAN AND TEMULAWAK
250
100%
DJAMOE

MENITEMU

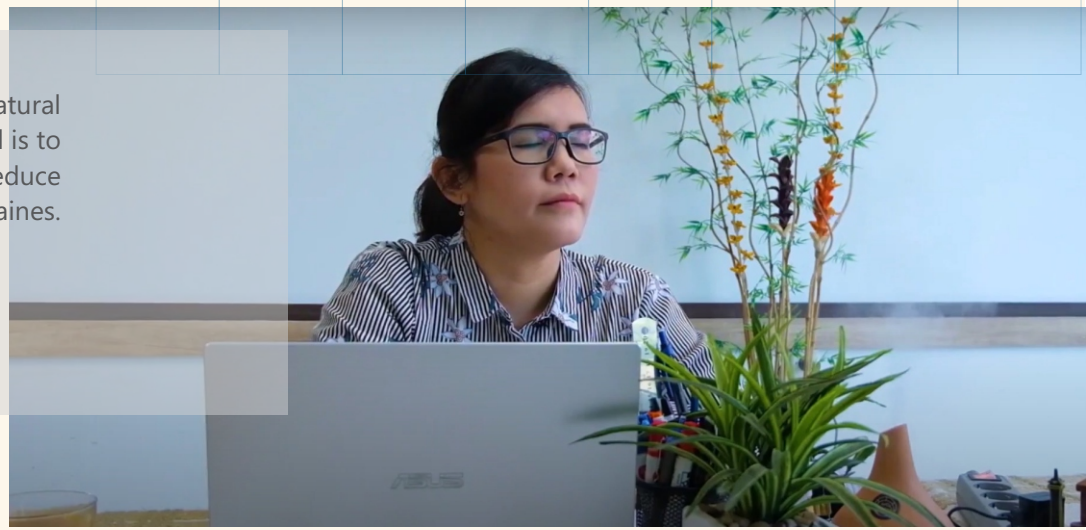
10

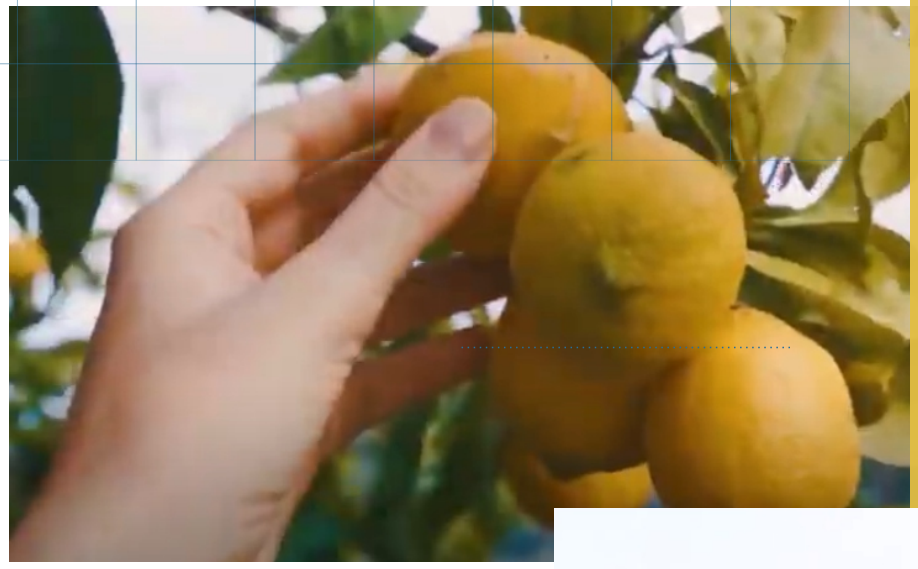
ITS Djamoe Hoilits

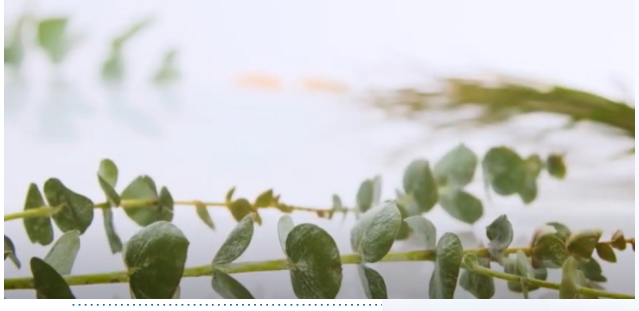
10

ITS Diamoe Hoilits

Hoilits is an essential oil made from selected natural ingredients. The function of this essential oil is to overcome stress, anxiety and depression, reduce headaches and migraines.







Hoilits

hoilits

HEALTHY OIL ITS

The Aromatherapy of
HOILITS is able to provide a
calming effect when used

CoFilm+

11

11

CoFilm+

The Covid-19 pandemic is still spreading and mutating, including in Indonesia. This prompted the Head of the Center for Advanced Materials and Nano Technology Research, Institut Teknologi Sepuluh Nopember (ITS), Dr. Agung Purniawan ST MEng, and his team innovate by making antiviral coatings and stickers called **CoFilm +.**

The coating and sticker paints use Nano Copper technology (nano-sized copper) as an active antiviral ingredient applied to surfaces that are often touched. As a result, the SARS COV-2 virus on the surface of CoFilm + 90 percent can die on the surface of objects given this coating paint within 10 minutes, while 99.9 percent of the virus can die within 1 hour.


CoFilm+
Disinfektan Permanen
Proteksi untuk
Negeri
99%
.999
Efektif
Permanen
Tahan
Lama
Teruji Lab.
BSL 3
COVID 19
Komposisi
Ramah
Lingkungan
Selalu
Melindungi
24
Jam
CoFilm+
Disinfektan Permanen
Antivirus


CoFilm+
Permanen
Disinfectan
CoFilm

The coating and sticker paints use Nano Copper technology (nano-sized copper) as an active antiviral ingredient applied to surfaces that are often touched. Examples of its application include door handles, stair railings, tables, and others in hospitals, schools, restaurants, offices, airports, malls, and private places.

According to him, Nano Copper technology was chosen because it is widely used as a material that can kill various kinds of viruses and bacteria. "Besides, Copper is also the only metal material that has been certified by the US EPA (Environmental Protection Agency)," he said.

Agung's innovation has also been tested at the Institute of Tropical Disease (ITD) Universitas Airlangga. As a result, the SARS COV-2 virus on the surface of CoFilm + 90 percent can die on the surface of objects given this coating paint within 10 minutes, while 99.9 percent of the virus can die within 1 hour. While on the surface of things without this antiviral coating, the virus can last more than 24 hours.

Some of the advantages include easy application, can perform disinfection for 24 hours continuously, and save costs. More than that, CoFilm + can also reduce nosocomial infections or infections acquired from health facilities such as hospitals and health centers.

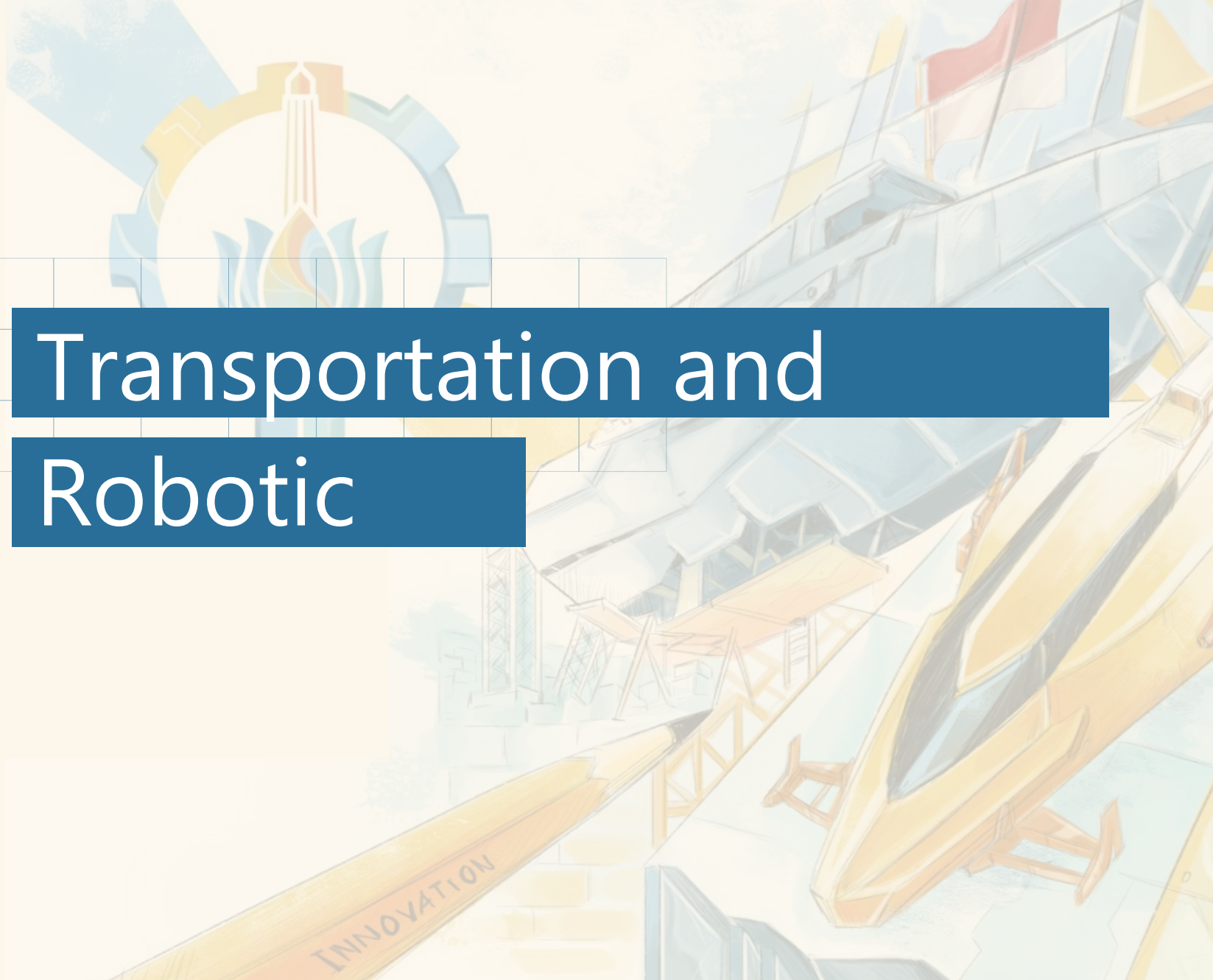
Meanwhile, the estimated price of each item depends on the area and type of the object. For example, for permanent coating per door handle, the cost is estimated to start from IDR 20 thousand. Meanwhile, tables with an area of up to 1.5 square meters start at IDR 150 thousand. "This price includes coating and maintenance services," he said.

CoFilm + is also available in the form of A3 size antivirus laminate stickers with prices starting at Rp. 60 thousand per sheet. CoFilm + trials have been carried out since January 2021 on several doors handles in offices such as One Roof Co-working space and PT. Earth.

CoFilm + comprehensive protection was first applied at the ITS Medical Center for all door handles, stair railings, tables, chair handles, switches, and handrails in early March. Even though it has been widely used, Agung explained that this coating paint's durability still needs further research before it can be developed into a product that is ready to be marketed.

On behalf of his team, Agung hopes that CoFilm + can be of broader use, especially at ITS as the birthplace of CoFilm +. And it can be applied to reduce the spread of infections from various viruses and bacteria during the Covid-19 pandemic. “Especially in the face-to-face learning discourse that will be opened starting from higher education,” he concluded.

Transportation and Robotic

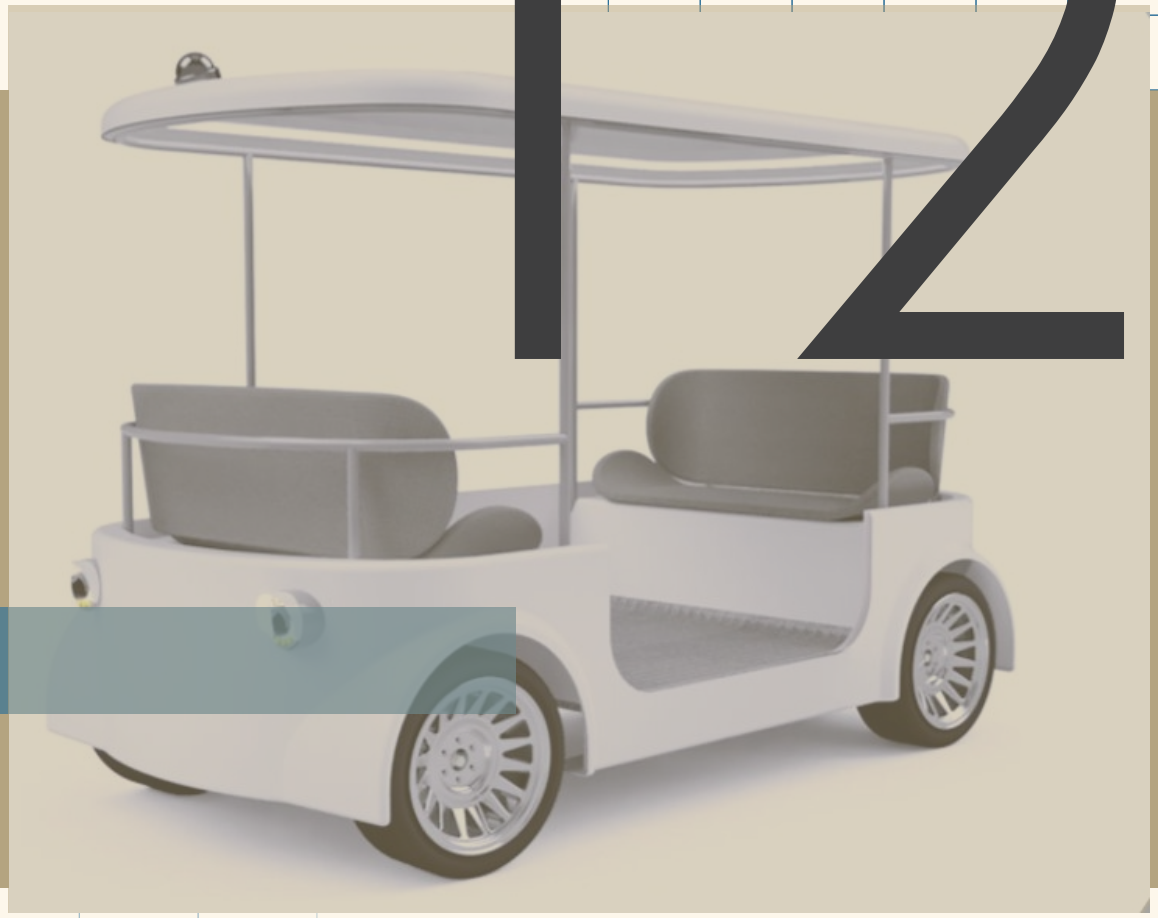


Icar
Iboat
Standing Water Detection
Bayucaraka
LRT
Fin Komodo

ITS
Innovative Products
2021

I Car

12



12

I Car

I-Car is an autonomous electric car prototype, which is an electric car that can run by its own without a driver but with the help of Artificial intelligence (AI) and Internet of Things (IoT) technology combinations.

LAUNCHING ICAR

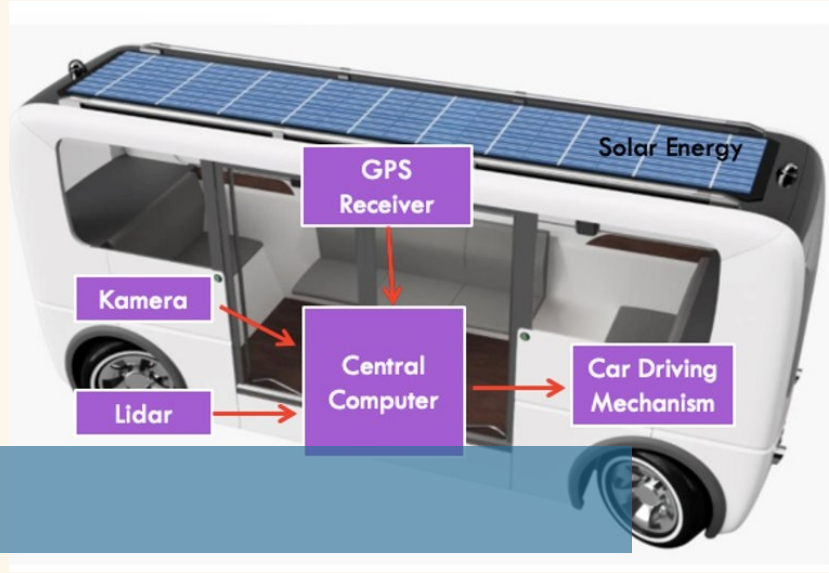
Spesifikasi Autonomous Car

- Golf Car 4 Seater
- Battery 48 VDC – 120AH
- Automatic Charger 48V – 18 A with automatic cut off system
- Controller 48V
- Custom Steering, Breaking & Throttle
- Panjang : 4,2 m
- Lebar : 1,3 m
- Sensor :
  - GPS dengan koreksi
  - LiDAR sensor
  - Camera
  - Odometry


RISTEK-BRIN
ITS
Institut Teknologi Sepuluh Nopember
PGA ITS
Persatuan Golf Alumni ITS
#INOVASI INDONESIA
WARNING
UJI COBA
MOBIL AUTONOMOUS
(OTOMATIS)

iCar ITS is an autonomous car prototype that is operated as a commuter car that serves trips within the ITS campus. The ITS academic community can call this car using an application on a smart phone, then the ITS iCar will come automatically and deliver the passengers to their destination.

iCar ITS is equipped with various sensors to ensure the system can run without a driver but still ensures the safety of its passengers. iCar ITS is equipped with a GPS (Global Positioning System) system with high accuracy, a LIDAR sensor combined with a camera to detect objects around the autonomous car, as well as various other sensors to detect the speed and orientation of the iCar.



Autonomous Driving

- **Perception**
  - *Obstacle Perception*
    - Semantic Motion Segmentation
    - Obstacle Detection and Tracking
    - Free Space Detection
  - *Path Perception*
    - Path Detection
  - *Wait Conditions Perception*
    - Traffic Light Classification
    - Traffic Sign Classification
    - Intersection Detection
- **Mapping**
  - *Localization in HD Map*
- **Driving Policy**
  - *Behaviour*

Body - Electronics - Smart Algorithm

I Car Designed as a commuter carin the ITS Campus area

ITS
Innovative Products
2021

13

IBOAT

13

I BOAT

Autonomous ship that could be operated by a combination of technology based on artificial intelligence and internet of things was launched by ITS Rector Prof. Dr. Ir Mochamad Ashari MEng, witnessed by a virtual invitation, namely the Minister of Transportation (Menhub) Ir Budi Karya Sumadi, Head of the National Disaster Management Agency (BNPB) Lieutenant General of the TNI Doni Monardo, Deputy Governor of East Java Dr H Emil Elestianto Dardak BBus MSc , and Chairman of IKA ITS Ir Sutopo Kristanto MM. This innovation product adds to its previous line of innovations such as RAISA robots and intelligent Car (i-Car).

ITS once again brings its latest innovations to the nation. In commemoration of Lustrum XII ITS and welcoming the National Maritime Day, ITS introduced an autopilot smart ship named intelligent Boat **(i-BOAT)** in a soft launching held at PT Galangan Kapal Madura (Gapura), Bangkalan, Madura.

Autonomous ship that could be operated by a combination of technology based on artificial intelligence and internet of things. i-BOAT comes with the intention of fulfilling the functions needed in the current maritime aspects, especially for humans, such as rescue, logistics fulfillment on islands in need of assistance, and defense and security functions.

In his speech via teleconference, the Minister of Transportation expressed his pride in the presence of its advanced ship innovations, especially this project in collaboration with alumni and industry in East Java. He said: "Later, the Ministry of Transportation (MoF) will create a pier to develop this research so that ITS does not have to do research elsewhere. The one who builds that also an ITS alumni, who are also Director General of Sea Transportation, Pak Agus (Ir Agus H Purnomo, red)," he said.

According to Budi, the release of i-BOAT is an innovation effort in the marine sector, especially shipping. "Hopefully later on November 10, i-BOAT can already operate massively, so that initially expected only two more years can be faster," he said hopefully.

For information, Indonesia as a maritime country with an island number of about 17 thousand more and a water area of 3.25 million square kilometers, the role of sea transportation is vital as a unifying nation. Without effective sea transportation and fulfilling aspects of shipping safety, logistics distribution issues can be ascertained, and furthermore will be followed by the issue of equitable development, especially in the archipelago.

According to these needs, i-BOAT comes with the intention of fulfilling the functions needed in the current maritime aspects, especially for humans, such as rescue, logistics fulfillment on islands in need of assistance, and defense and security functions.

Also present gave a virtual speech, Deputy Governor of East Java Dr. H Emil Elestianto Dardak BBus MSc. He said, a form of regional commitment to always support research development has been launched, many innovation programs developed during covid, and ITS always participates in contributing its innovations.

"With these works, we will not give up to support and work together to give partiality to ITS and the work of other local contributor," said Emil straightforwardly.

Boat

Autonomous Boat Prototype *(Autonomous Boat)*

The boat can run itself equipped with artificial intelligence technology *(Artificial Intelligence)*

Three features of the operating system:

- *Manual operated*
- *Remotely operated*
- *Fully autonomous*

Main mission:

- Transport logistik
- *Rescue boat*

In fact, continued Emil, the Provincial Government of East Java through the relevant agency will provide land that has waters to use ITS in conducting its research in the maritime field.

The launch of i-BOAT was also welcomed by the Chairman of the National Disaster Management Agency (BNPB) Lieutenant General of the TNI Doni Monardo. In his speech online, he appreciated the innovation of the nation's children and wanted other young people to be challenged to innovate.

"Today's work is expected to increase the motivation of other young researchers to improve their discovery in various fields," he said encouragingly. Even in his speech, Doni once revealed that BNPB is interested in buying the smart ship with technology that will be tailored to the needs of BNPB later.

In the meantime, two units of ships first and will be used for BNPB center. "Furthermore, if it is suitable and in accordance with the needs, then BNPB will increase orders for regional BNPB that has a threat of disaster due to hydrometeorology," added Doni.

Not to be missed, there is also through zoom application, Chairman of IKA ITS Ir Sutopo Kristanto MM. In his speech, he said that IKA ITS will always support the downstream process of ITS innovation products through a network owned by alumni. "IKA ITS always strives to observe what are the results of innovations produced by our alma mater, and we always try to create a roadmap for how the results of these innovations can be downstreamed," he said with full support.

This i-BOAT product was successfully realized through the cooperation of 10 research titles with funding and coordination from its Directorate of Research and Community Service (DRPM) and its Directorate of Innovation and Technology Science Area (DIKST). Furthermore, DRPM formed a research consortium involving nine engineering departments and two Tekno Park Science clusters (STP), namely STP–ICT Innovation Cluster & Robotics and STP–Maritime Cluster.

For the way the i-Boat works itself, Maritim Cluster Manager – STP ITS Ir Tri Achmadi PhD explained that the ship is controlled by the operator. In terms of operational features, i-BOAT is designed to be ordered to go to certain coordinate locations that have been set before.

"If there is an internet connection in the operational area, users can use this i-BOAT through a user interface application, both web-based and operating through android gadgets (smart-phone)," he explained.

Based on the operator's orders, he continued, i-BOAT will sail towards the desired coordinate target. I-Boat also has the advantage of being wave resistant and able to survive in all weathers. In the development of the next stage of research, i-BOAT will have features in the form of summoning and setting destination coordinates that can be done for a wider sea area.

What distinguishes it from other ships is the electronic aspect. Because it uses an autonomous system, the ship which has an empty weight of 415 kilograms and is driven by an outboard petrol engine with Propeller propulsion which has a power of 40 HP through Petroleum Octane 92 at engine speed of 4,500 – 5,500 RPM has the ability to automatic start, automatic control and remotely controlled. included can also be changed back to manual control.

ITS
Innovative Products
2021

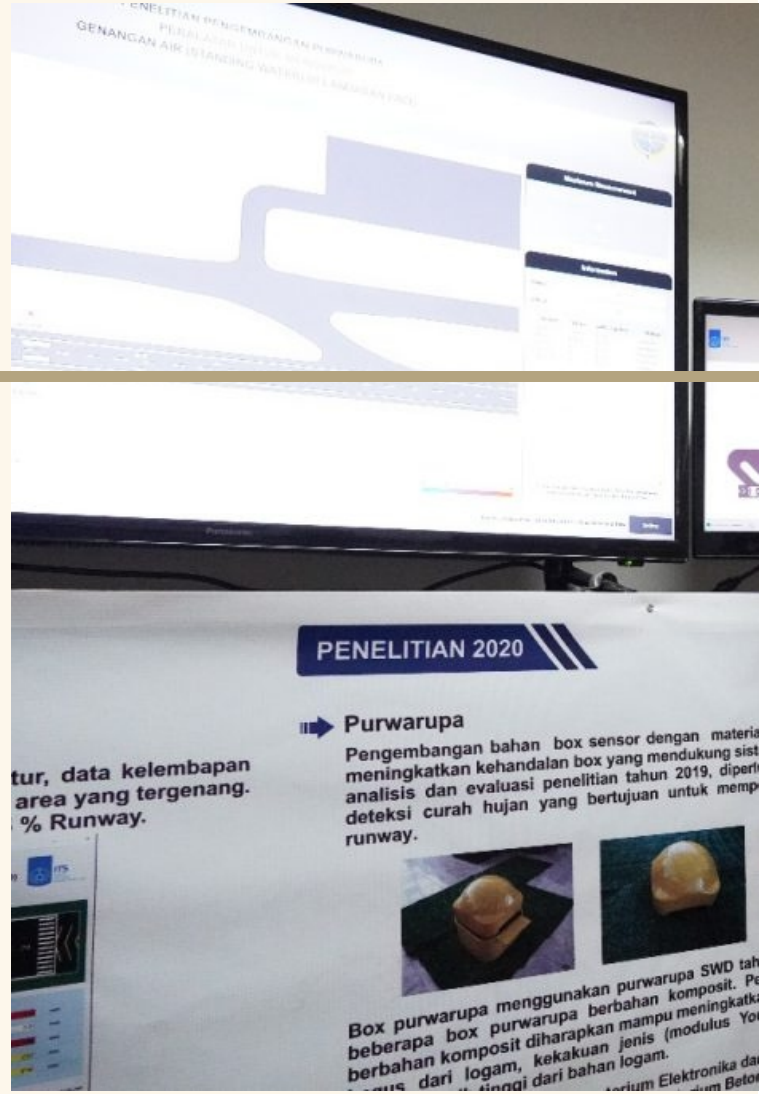
14

Standing Water Detector

14

SWD

Sepuluh Nopember Institute of Technology (ITS) together with the Research and Development Center for Air Transportation (Puslitbang TU) Balitbang Ministry of Transportation continues to strive to develop the results of their research in the form of a **Standing Water Detector (SWD)** or a device for detecting high standing water on the runway airport (airport). The reliability of the research that has been carried out since 2018 was discussed in an online Focus Group Discussion (FGD)



As is known, the high rainfall in several regions in Indonesia has triggered a puddle of water on the runway or runway at the airport, thus threatening the safety of planes that will land. Therefore, this research was conducted to support the development of aviation safety equipment.

The Head Researcher of SWD, Dr. Melania Suweni Muntini MT, explained that the main problem in aviation is that airplane pilots often do not get real-time information about standing water on the runway. "With this tool, we will get information about the height of the standing water on the runway so that the information can be used for various purposes," she explained.

For the next six months, continued the lecturer, who is familiarly called Melani now; the development started in 2018 is focused on the reliability test of SWD with tests carried out directly at Yogyakarta International Airport (YIA). This year, sensors were added to measure the real-time rainfall. "Measurement of rainfall will work in conjunction with measuring water levels," she said.

Apart from the airport, testing was also carried out at the ITS Physics Department's open laboratory to ensure that the equipment worked properly in both places. "Another reason is that when it rains at the airport, we cannot see the equipment directly because it is dangerous. "In the lab, we can calibrate directly after data acquisition," said Melani.

This tool has two detection systems, namely hardware, and software. For software, data such as the runway profile in the form of roughness and the runway slope. The hardware itself will be able to detect air temperature and humidity. "For the standing water detection method, we refer to the Regulation of the Director-General of Civil Aviation No. KP 39/2015 and Annex 14, Aerodrome, "explained the ITS Physics Department lecturer.

In operation, the SWD prototype will be placed beside the runway in the touchdown area. When it rains, the water flow from the runway will touch the prototype's sensors, which will then be converted into digital data. Then combined with secondary data such as runway profiles, it will provide output in the form of standing water heights. A reminder will flash when 25 percent of the instrument indicates that the altitude is equal to or greater than 3 millimeters.

15

BAYUCARAKA

BAYUCARAKA

15

BAYUCARAKA

Bayucaraka ITS is an UAV (Unmanned Aerial Vehicle) research team operating under ITS Robotics. This team was founded in 2014. The team was formed until now, Bayucaraka ITS Team has had many champion awards in both national and international competitions. We participate in annual competitions such as KRTI and Tubitak UAV Competition. This team has 5 main divisions including VTOL (Vertical take off and landing), Racing Plane, Fixed Wings, Technology Development, and Official.

The name Bayucaraka ITS is taken from the Sansekerta language ‘Vāyu’ which means air and ‘Caraka’ which means wanderer. Overall, the name Bayucaraka ITS means Air Nomads through innovative work and research in the UAV (Unmanned Aerial Vehicle). This team also has a hashtag, namely #GarudakuJayaSelalu, which means The Bayucaraka Team is ready to continue to bring glory to The Indonesian skies through their work and research.

BAYUCARAKA

BAYUCARAKA ITS

16

LRT


160
Km/h
Fast & Safe
Efficient & Eco Friendly
Modern Transportation

16

LRT

Rancang Bangun Eksterior & Interior Carbody Light Rail Transit (LRT)

Rancang Bangun Eksterior & Interior Carbody Medium Speed Train

Rancang Bangun Eksterior & Interior Carbody Medium Speed Train

FIN KOMODO Bledhex 17

17

FIN COMODO Bledhex

ITS in collaboration with PT Fin Komodo Technology

In terms of specifications, Fin Bledhex uses a lithium-ion battery with a capacity of 21 kWh. With this battery, the power generated from the Fin Bledhex reaches 24 kW or the equivalent of 32.2 TK and 70 Nm of torque.

For configuration, the Fin Bledhex electric motor is placed in the middle, precisely behind the cabin and is rear-wheel-drive.

For charging time, it only takes 3 hours with 6,000 watts of power and can be used up to 150 km.

In terms of dimensions, the Komodo Fin has a total length of 3.4 m, a width of 1,635 m, and a height of 1,645 m. This dimension is quite ideal for two passengers to enter in the cabin. Then on the back is also made a multipurpose tub. The most visible difference in the cabin Fin Bledhex.

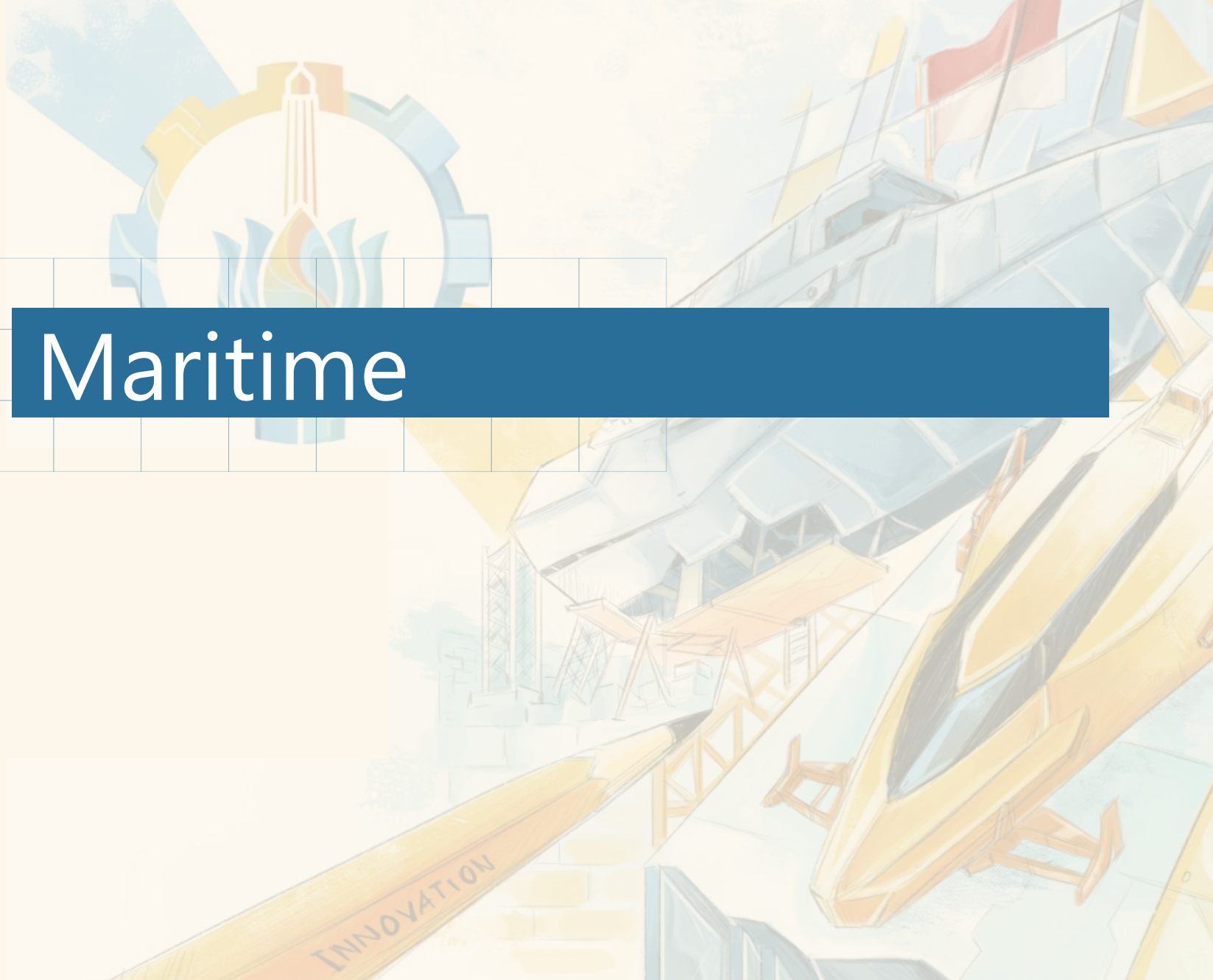
The instrument cluster is fully digital. Then the transmission, using a single speed reduction gear model with a choice of Hi - Low - Reverse.

Fin

Comodo

Bledrex

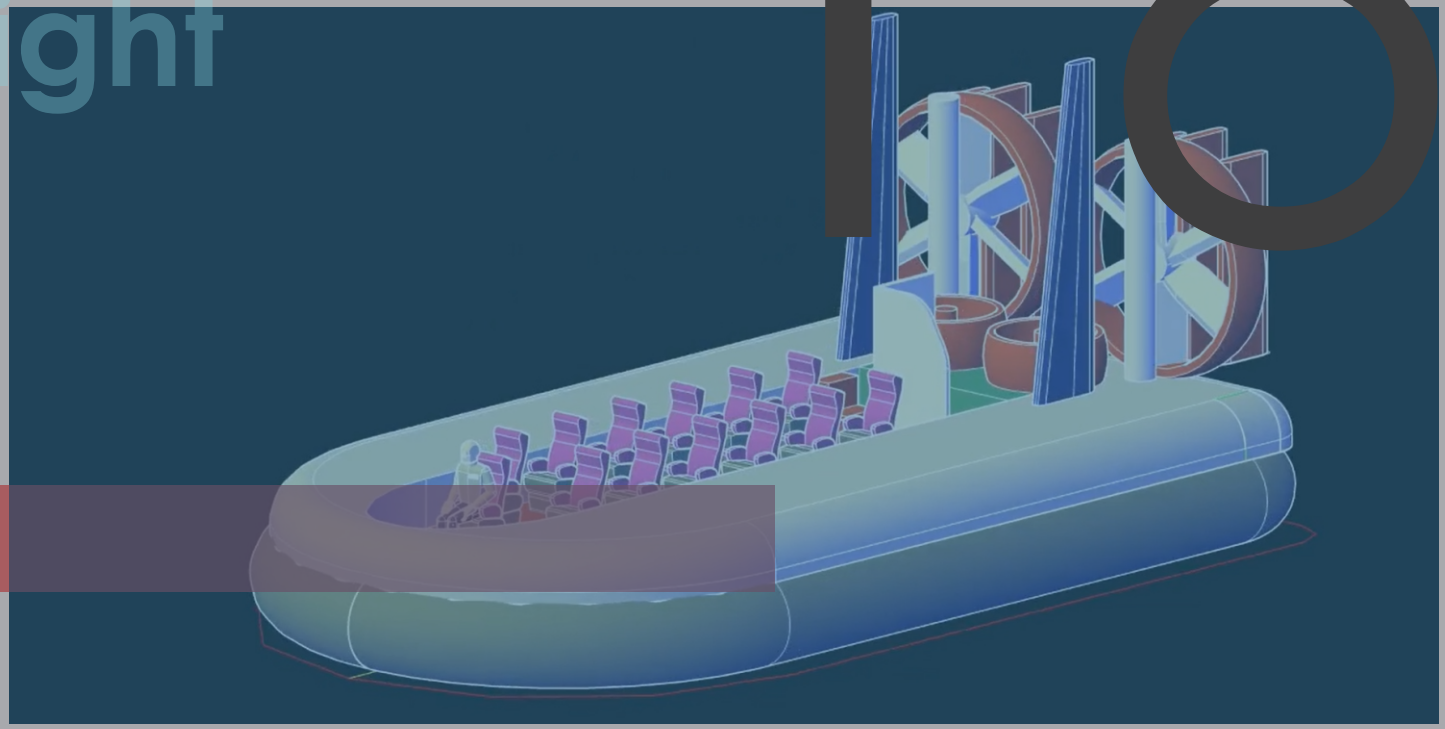
Maritime



Hover Flight
Swath Boat -Flight
Aquaculture
iStow
Aists

Hover Flight

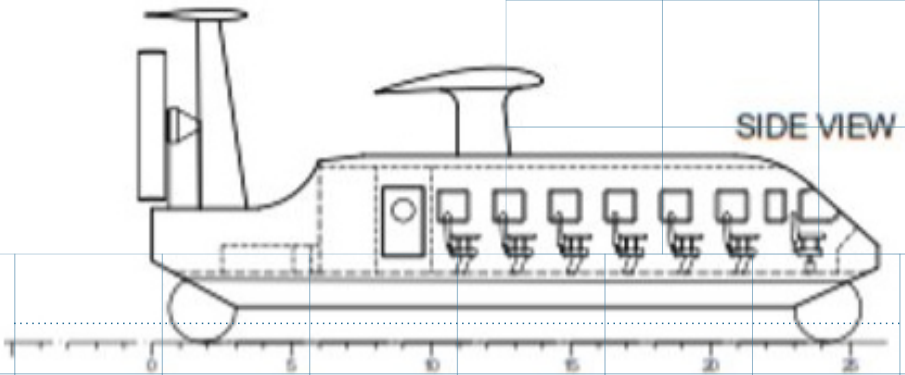
18

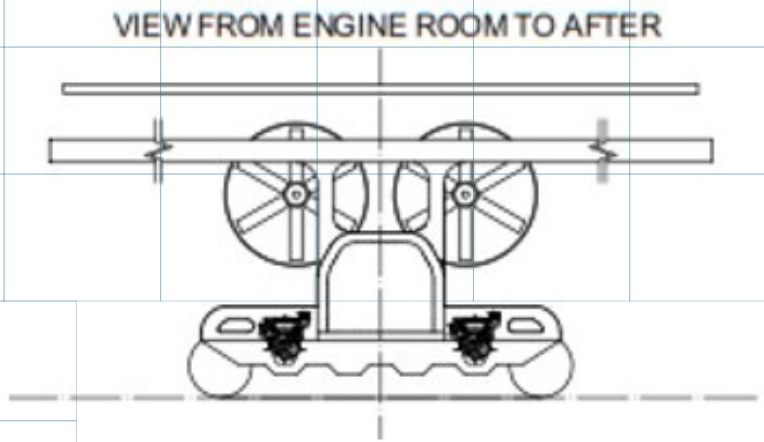


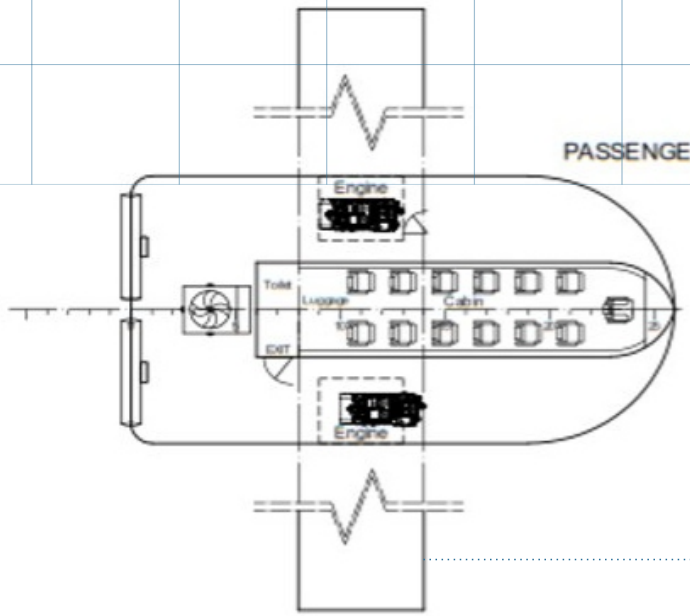
18

Hover Flight

Hoverwing is a development of hovercraft that has been developed for a long time, especially for transportation in river and swamp areas



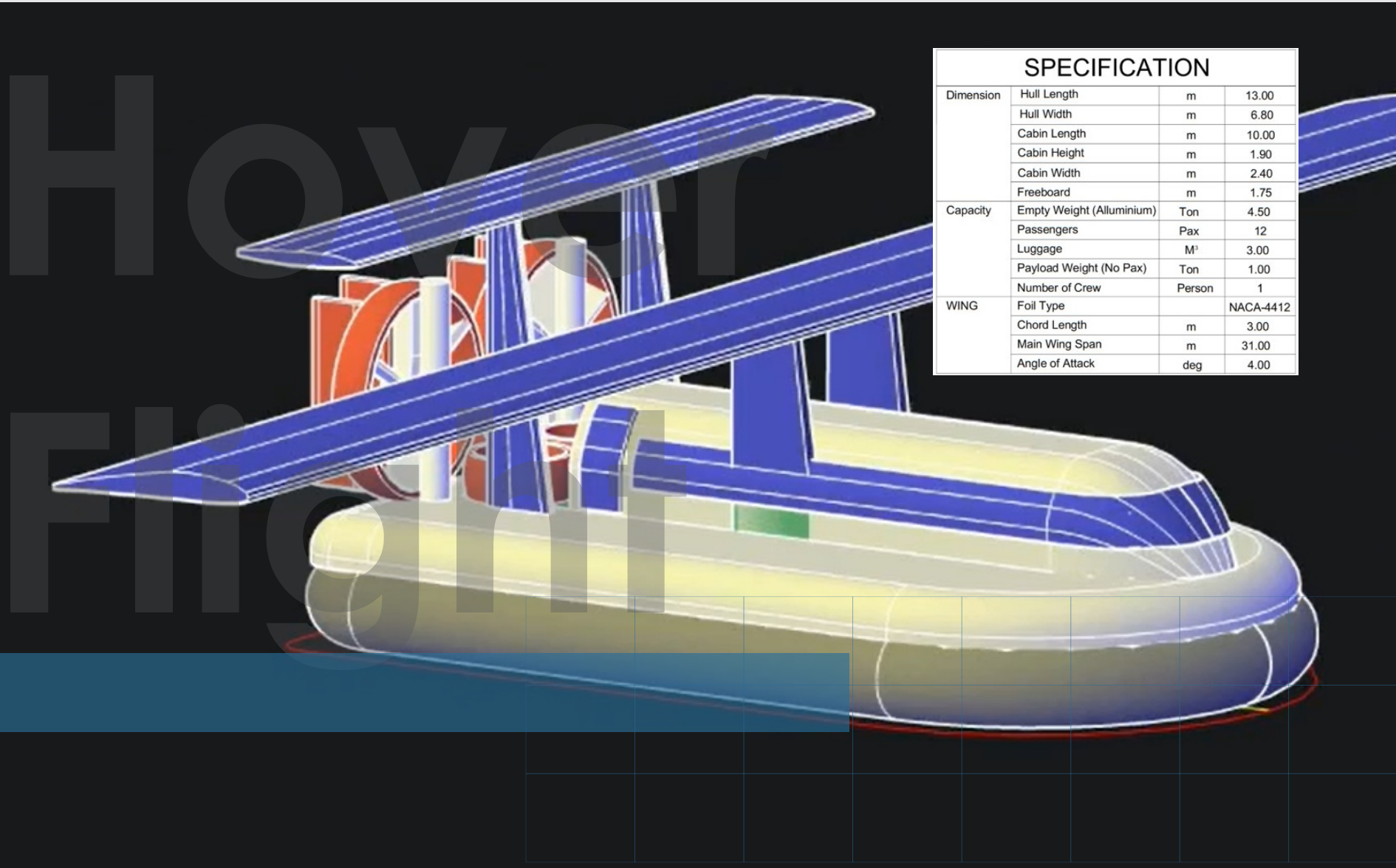




The hovercraft is then given additional wings so that it can float to a certain height using the "Wing In Ground Effect" (not affected by the height of the sea waves)

Applications: Marine Transportation, Maritime Tourism, Maritime Patrol, Maritime Search and Rescue

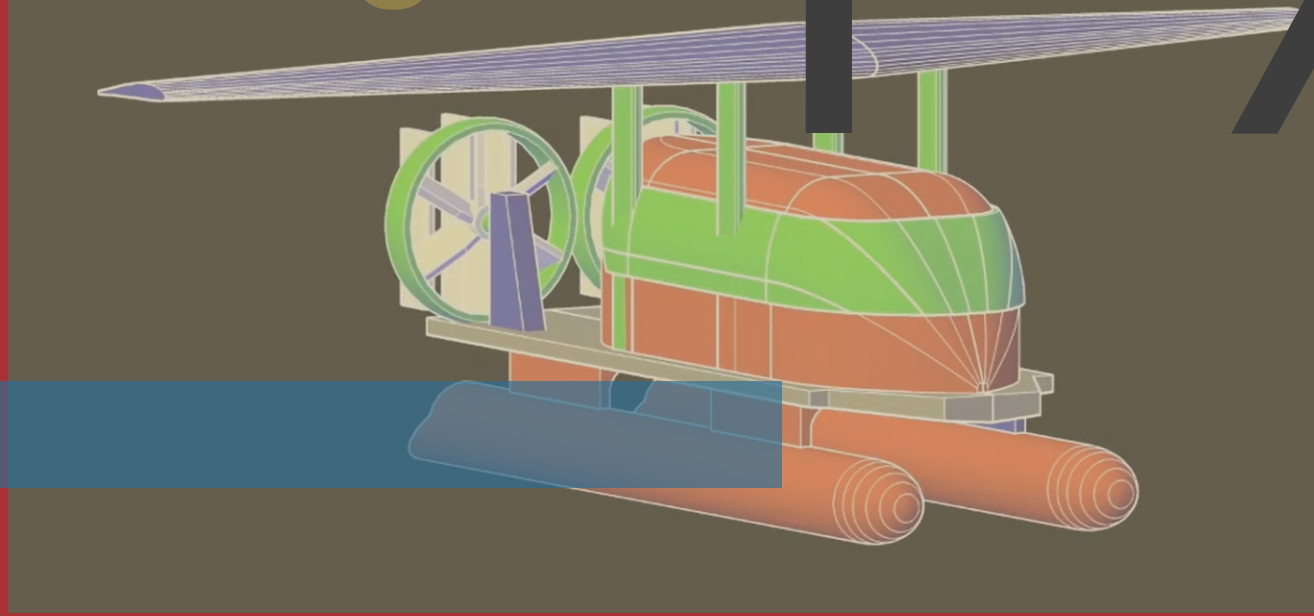
Partner:
Hovercraft Design & Operator Expert (Australia)
Investors:
Persh. Australia's maritime tourism sector



SPECIFICATION			
Dimension	Hull Length	m	13.00
	Hull Width	m	6.80
	Cabin Length	m	10.00
	Cabin Height	m	1.90
	Cabin Width	m	2.40
	Freeboard	m	1.75
Capacity	Empty Weight (Alluminium)	Ton	4.50
	Passengers	Pax	12
	Luggage	M^3	3.00
	Payload Weight (No Pax)	Ton	1.00
	Number of Crew	Person	1
WING	Foil Type		NACA-4412
	Chord Length	m	3.00
	Main Wing Span	m	31.00
	Angle of Attack	deg	4.00

19

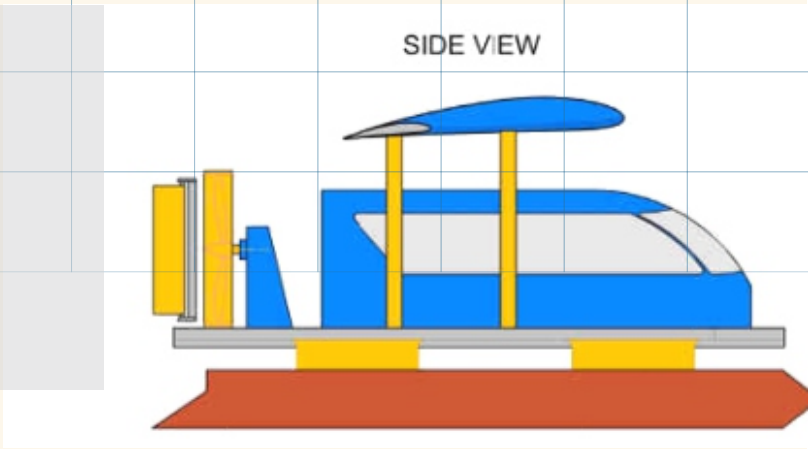
SWATH – Boat Flight



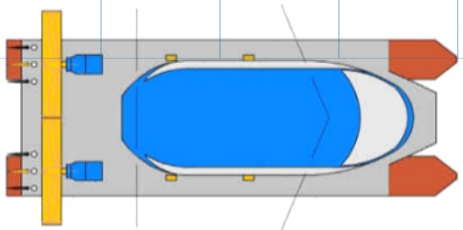
19

Desain SWATH - Boat Flight

SWATH, Small Waterplan Area Twin Hullminimizes hull cross-sectional area at sea level and Minimizes vessel volume near sea level, where wave energy resides, maximizing vessel stability, even on the high seas and at high speeds.



TOP VIEW



FRONT VIEW

SPECIFICATION			
Dimension	Hull Length	m	8.50
	Hull Width	m	3.00
	Hull Height	m	0.60
	Draught	m	0.30
	Cabin Length	m	5.60
	Cabin Height	m	1.80
	Cabin Width	m	2.20
Capacity	Empty Weight (Alluminium)	Ton	6.00
	Passengers	Pax	6
	Number of Crew	Person	1
WING	Foil Type		NACA-4412
Engine	Air Engine (Gasoline)	HP	2 x 1300

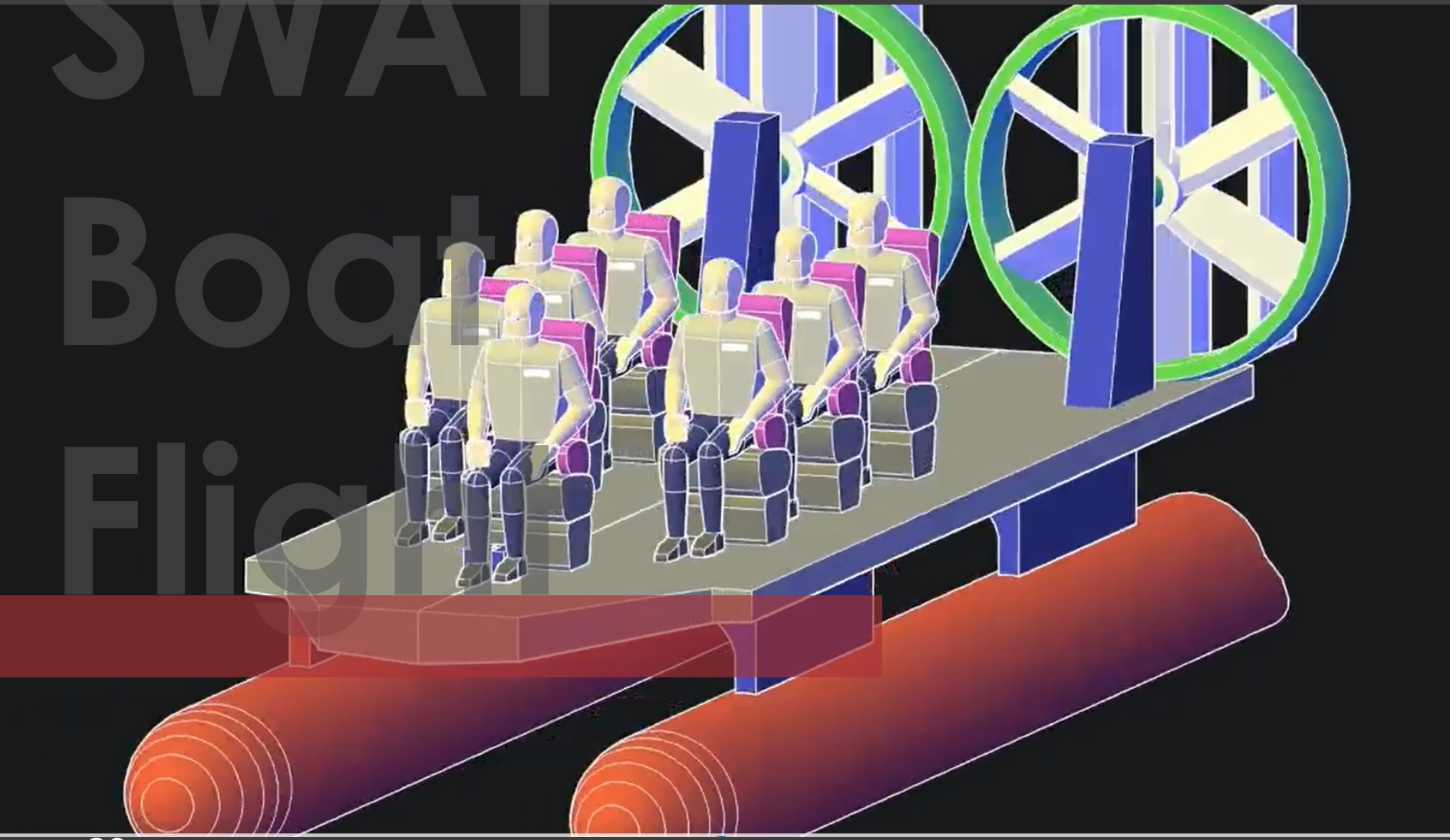
SWAT is then given additional wings so that it can float to a certain height using the "Wing In Ground Effect" (not affected by the height of the ocean waves)

Application:
Sea Transportation, Maritime Tourism, Maritime Patrol, Maritime Search and Rescue

Partner:
Hovercraft Design & Operator Expert (Australia)

Investors:
Persh. Australia's maritime tourism sector

SWAT Boat Flight



20

AQUACULTURE

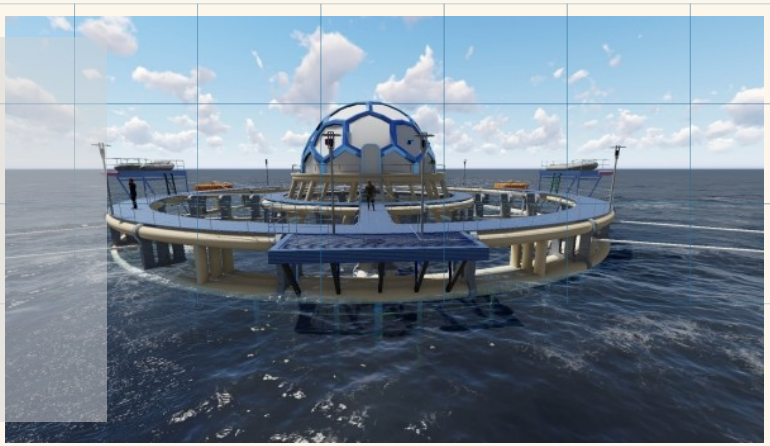
AQUACULTURE

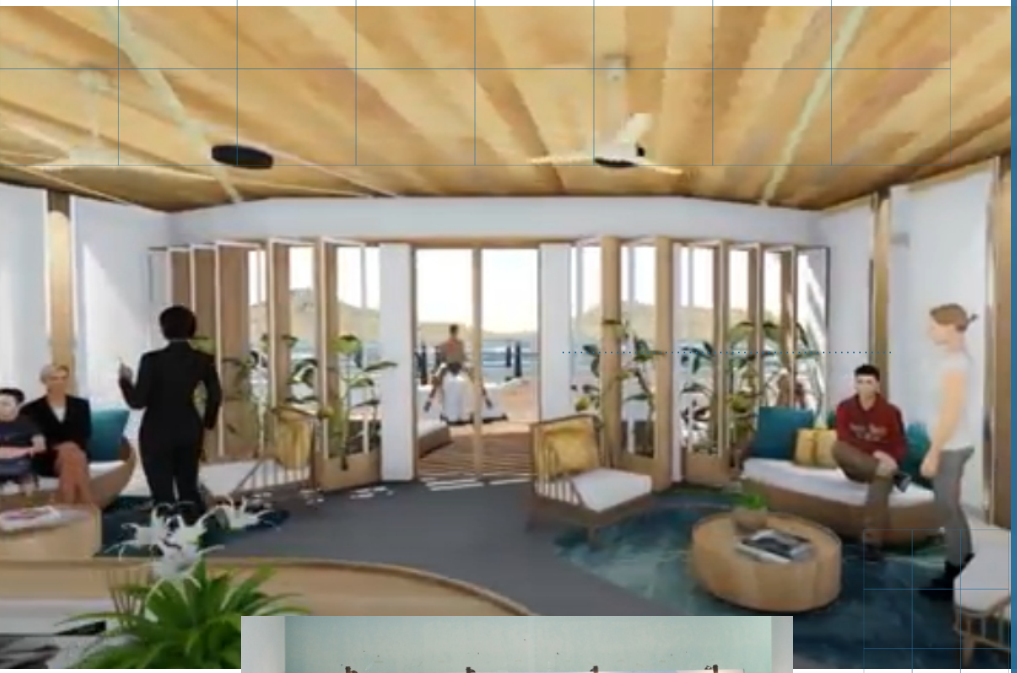
Ocean Farm ITS

20

AQUACULTURE
Ocean Farm ITS

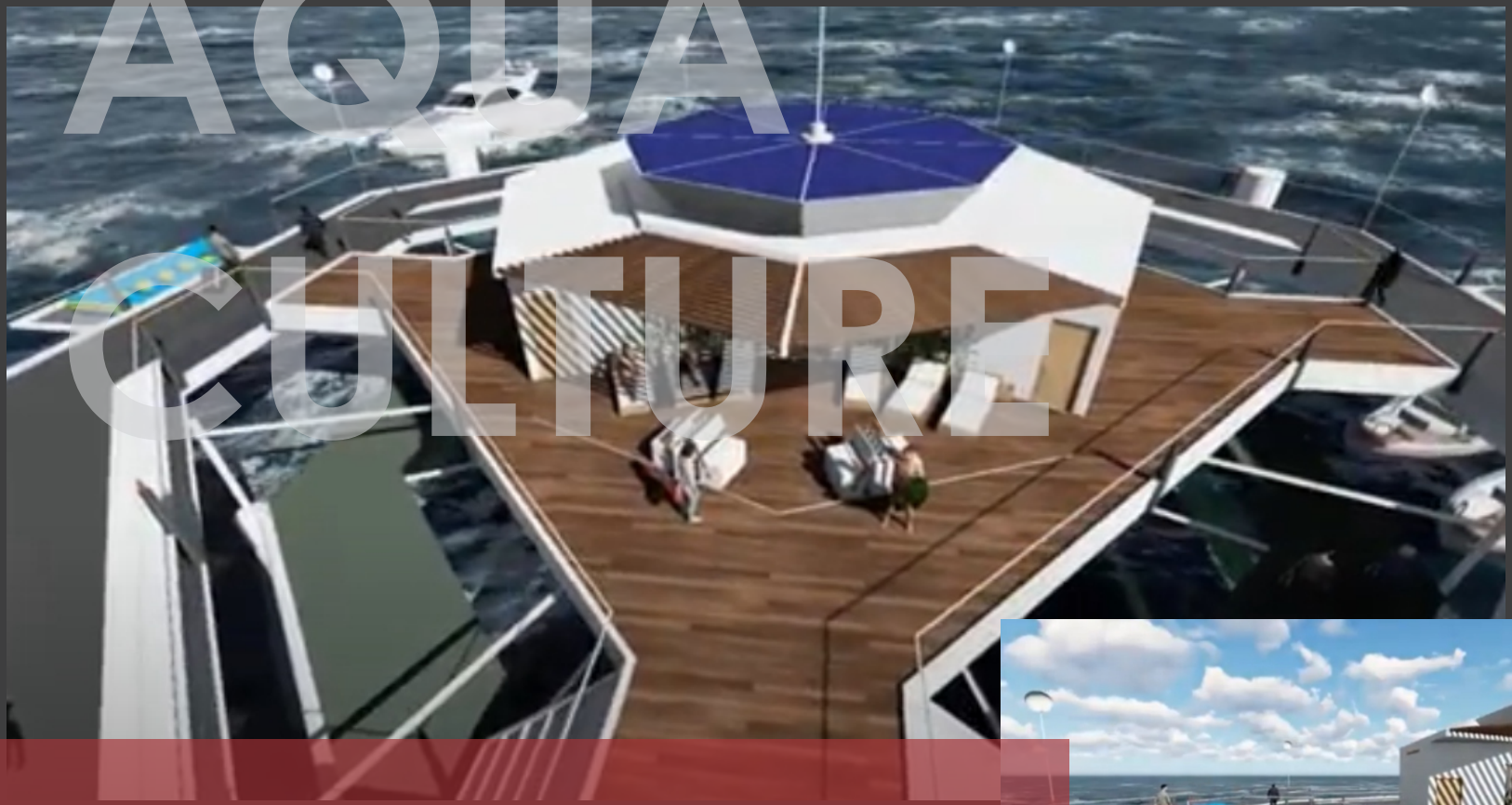
Institut Teknologi Sepuluh Nopember (ITS) is increasingly establishing themselves as a leading maritime campus in Indonesia with a variety of innovative steps. This time, a team of lecturers from the Department of Ocean Engineering together with the Directorate of Research and Community Service (DRPM) ITS pioneered a new breakthrough in the maritime sector in the form of a aquaculture building with the first floating marine ecotourism in Indonesia called **Ocean FarmITS.**

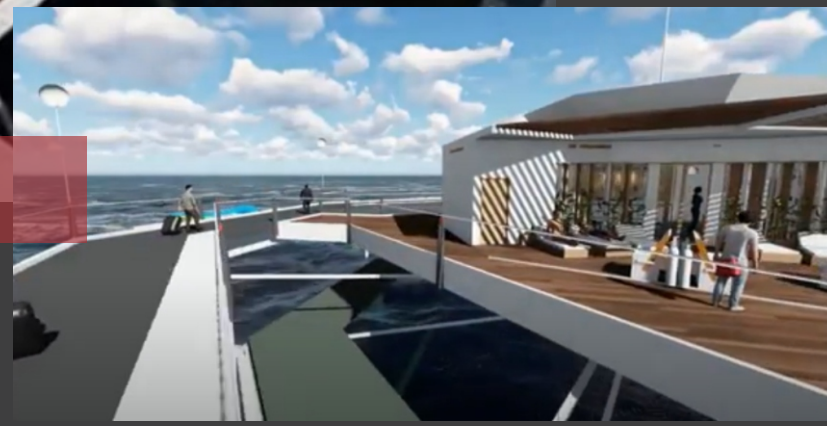




The collaboration between Ocean Engineering, Biology, Interior Design, Visual Communication Design (DKV), and Industrial Engineering is expected to be one of ITS's flagship works. Until the soft launching of the building on February 23 in Malang, which was also supported by PT Pertamina, the project has already spent around Rp 1.3 billion.

AQUA CULTURE





iStow

iStow

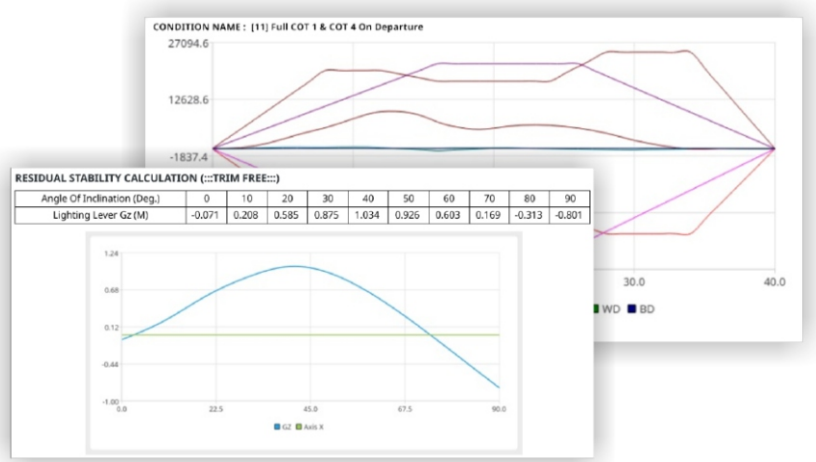
21

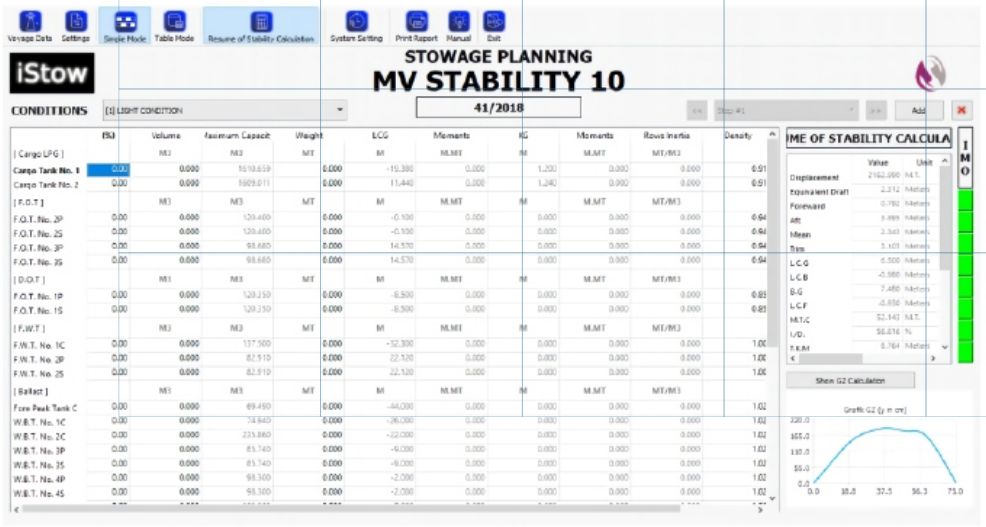
iStow

iStow, a stowage software, is a tool for ships to plan cargo allocation on board, where ships in all conditions must meet all International Maritime Organization (IMO) safety criteria. IMO has required all vessels with length over 65 meters to be equipped with a storage planning software.

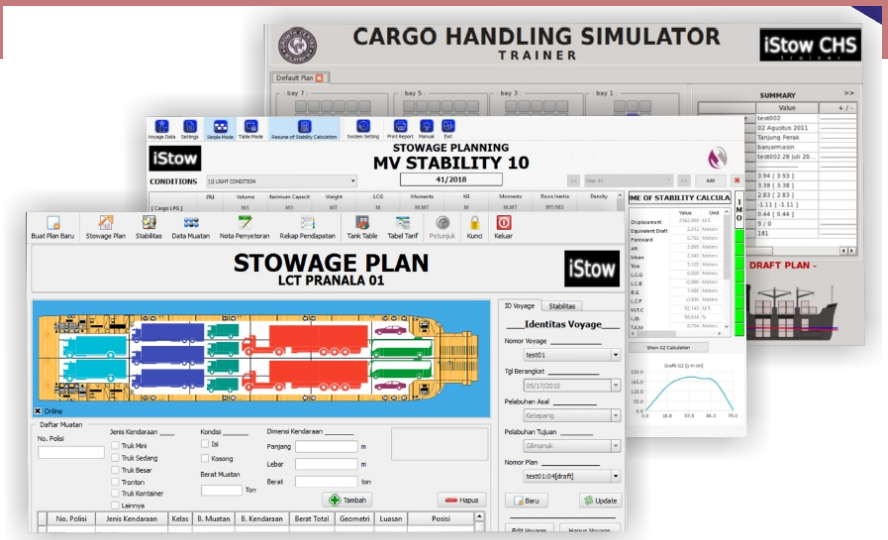
Varian

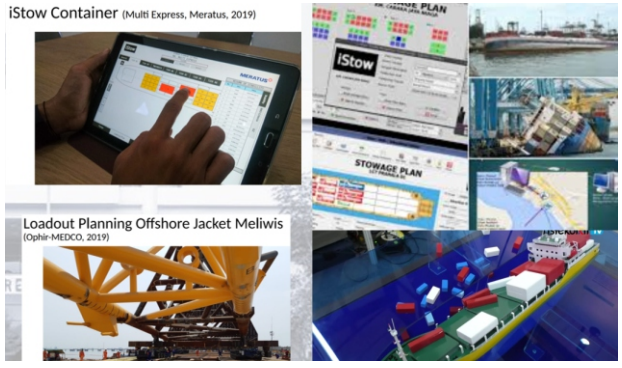
- iStow Container
- iStow Tanker
- iStow Ferry/Ro-ro
- iStow CHS
- iStow LCT
- iStow LPH

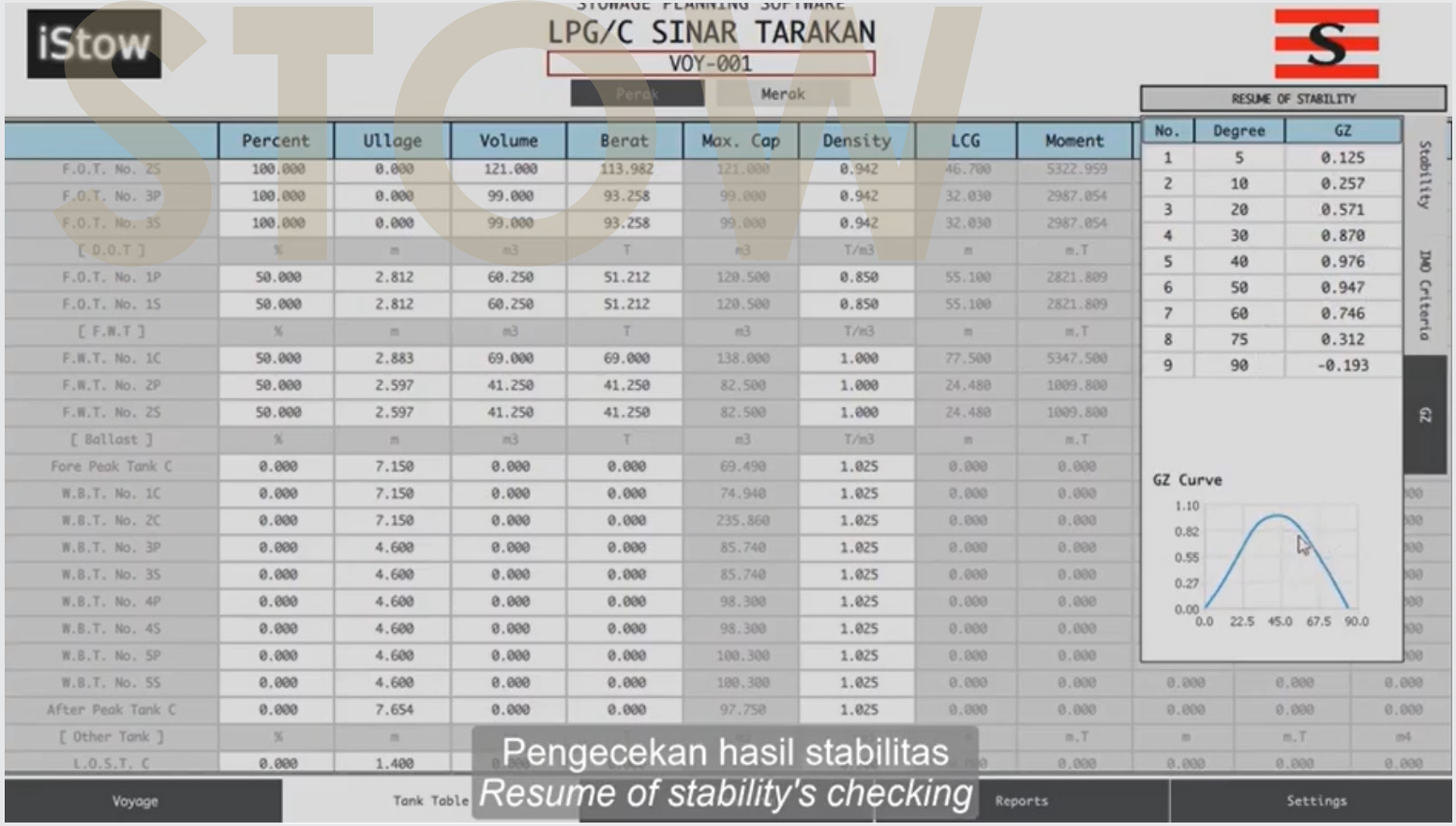




Accurate stowage planning is crucial for maritime safety. iStow is an application which is accurately developed to ensure the process of stowage planning. iStow meets with national and international standards as well. Its architecture is designed according to maritime industrial standard. iStow is capable to perform stability calculation faster and more reliable with consistency in manifest data. iStow is also designed in such a way so it can be easily adapted with other applications and systems.
iStow package comes with: 1. Automatically calculate intake and damage stability, bending moments and shear forces, 2. Network architecture: Client server, 3. Standards clearance document such as manifest, ullage report, bayplan, 3. Multi OS : Windows and Linux, 4. Technical support.
iStow variants are also available : iStow Container, iStow Tanker, iStow Ferry/ Ro ro, iStow CHS, iStow LST and iStow LPH



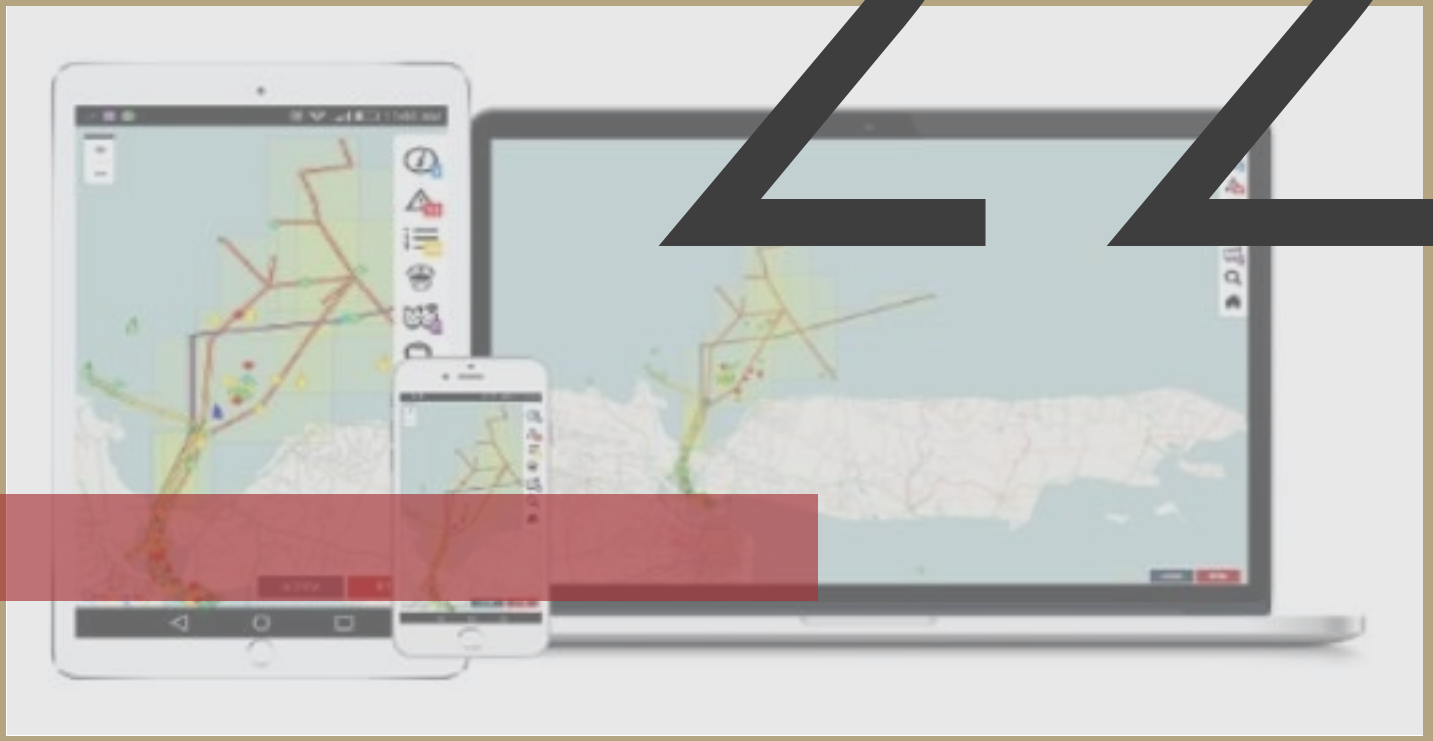




Pengecekan hasil stabilitas
Resume of stability's checking

AISITS

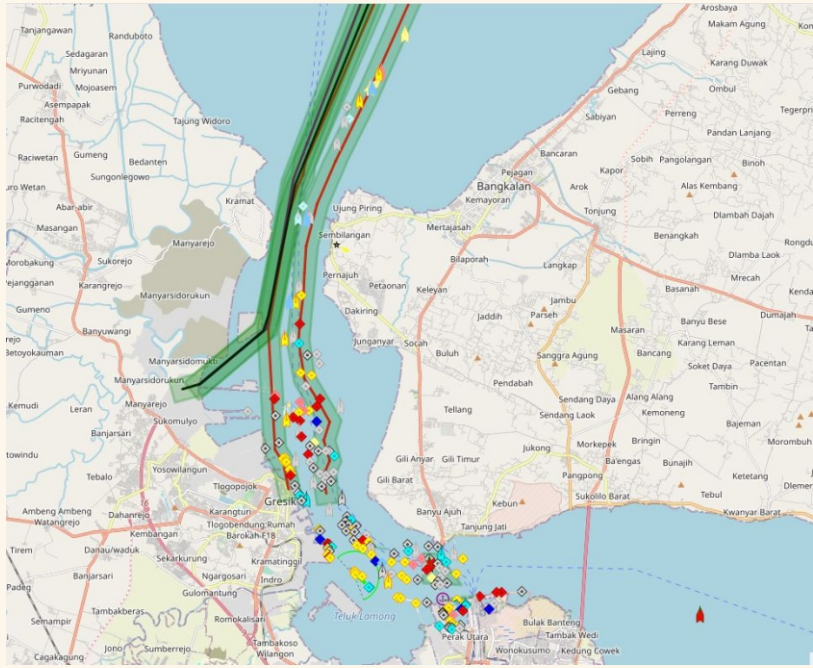
22

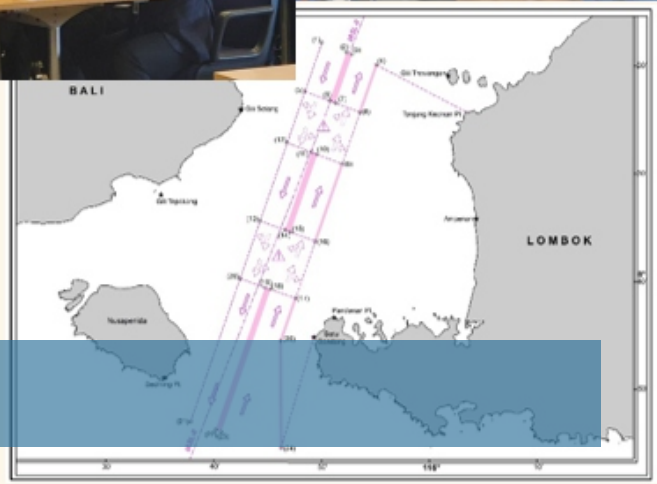


22

AISITS

AISITS: Early Warning System (EWS) AISITS-EWS is AIS-based and real time early warning system developed by ITS to provide alert systems in order to maintain the safety of Ships, Offshore Structure, Marine Installation including subsea pipeline, subsea cable and other installations at sea. This platform has been commercially used by oil and gas companies to avoid offshore structures and marine installation being affected/collided by marine traffic.





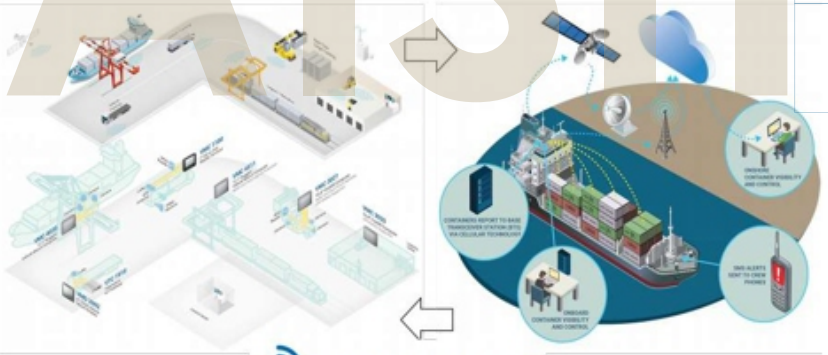
AISITS is an innovative product developed by ITS Center for Excellence of Maritime Safety and Marine Installation, which utilizes an automatic identification system (AIS) as data for monitoring vessels, monitoring the safety of marine installations, monitoring the efficient use of fuel oil on ships, monitoring the ships at port, or even able to monitor the marine environment such as coral reef, oil spill and others. It can also be utilized as a platform to avoid collision between vessels.

AISITS has also been utilized to monitor vessels in Archipelagic Sea Lanes (ASL) and it has also been used as a basis in some studies to establish some straits (Sunda Strait and Lombok Strait) recognized in implementing Traffic Separation System (TSS).

Currently, 12 national universities have joined in AIS Research Consortium in order to enlarge the coverage of AISITS, and at the same time to establish a joint research platform and knowledge transfer. AISITS has been granted by PUI KEKAL ITS to those universities.

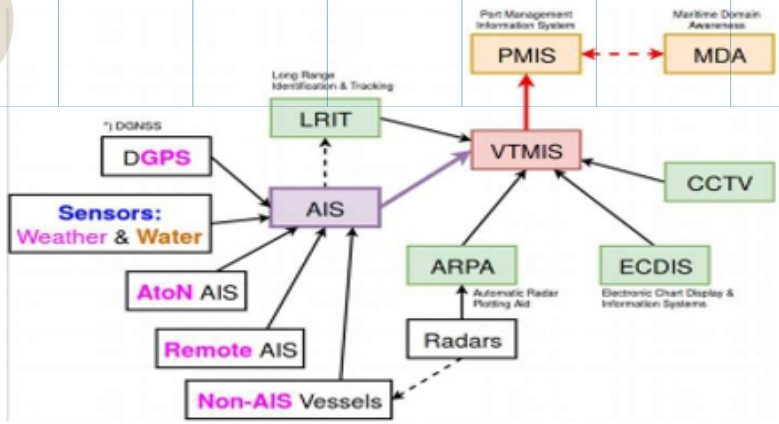
AISITS

AISITS-Log - AIS Based logistic monitoring system
AISITS-Port - AIS Based Port monitoring system
AISITS-Folo - AIS Based Fuel Oil monitoring system
AISITS-Enviro - AIS Based Emission monitoring system

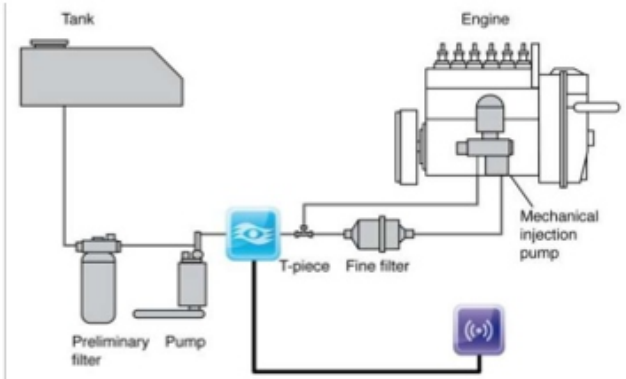


AISITS-LOG
AISITS LOGISTIC MANAGEMENT

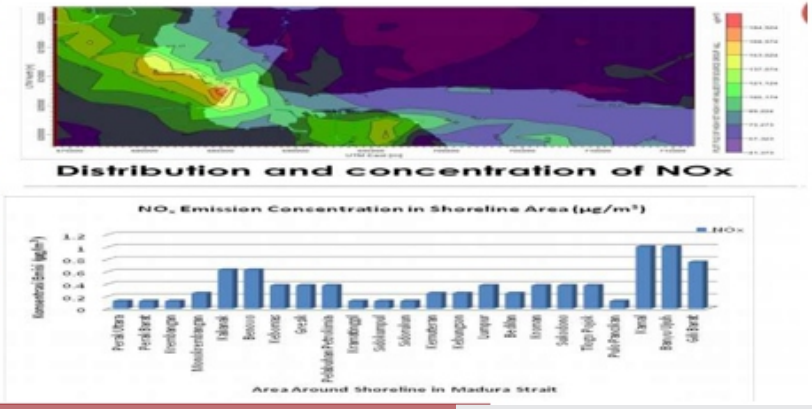
AISITS-PORT
AISITS PORT MANAGEMENT SYSTEM



AISITS-FOLO
AISITS FUEL OIL AND LUB OIL MONITORING SYSTEM



AISITS-ENVIRO
AISITS EMISSION MONITORING SYSTEM



Defence and Reuseable Energy

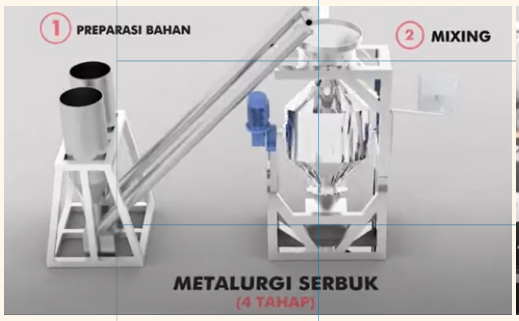
Frangible Bullet
The Croc
Waste to Electrical Energy Processing (PSEL)
Students Community Outreach Program

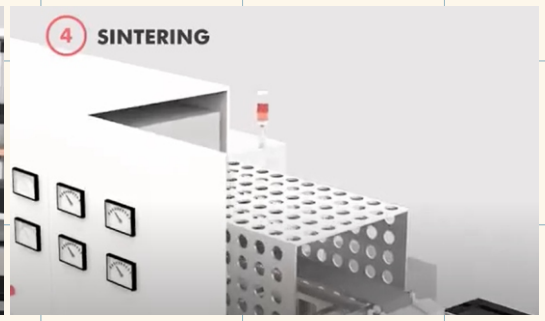
23 Frangible Bullet

23

Frangible Bullet

The frangible bullet is one of the innovations in the defense sector that has superior capabilities compared to conventional projectiles and is environmentally friendly. Since 2009, the development of frangible bullet projectile research has been carried out in the material physics laboratory of the ITS Material Engineering Department. After obtaining technical certification from PT. PINDAD Persero, now the production process is carried out to a wider scale, namely the mass production process.





Bullet Research Roadmap since 2009 at ITS

A.
Development of cladding, lead bullet, armor piercing
(2009 - 2017)

B.
Frangible bullet development
(2013 - 2020)

C.
Certification and Development of Frangible bullet production lines based on MMCs and PMCs
(2017 - 2024)

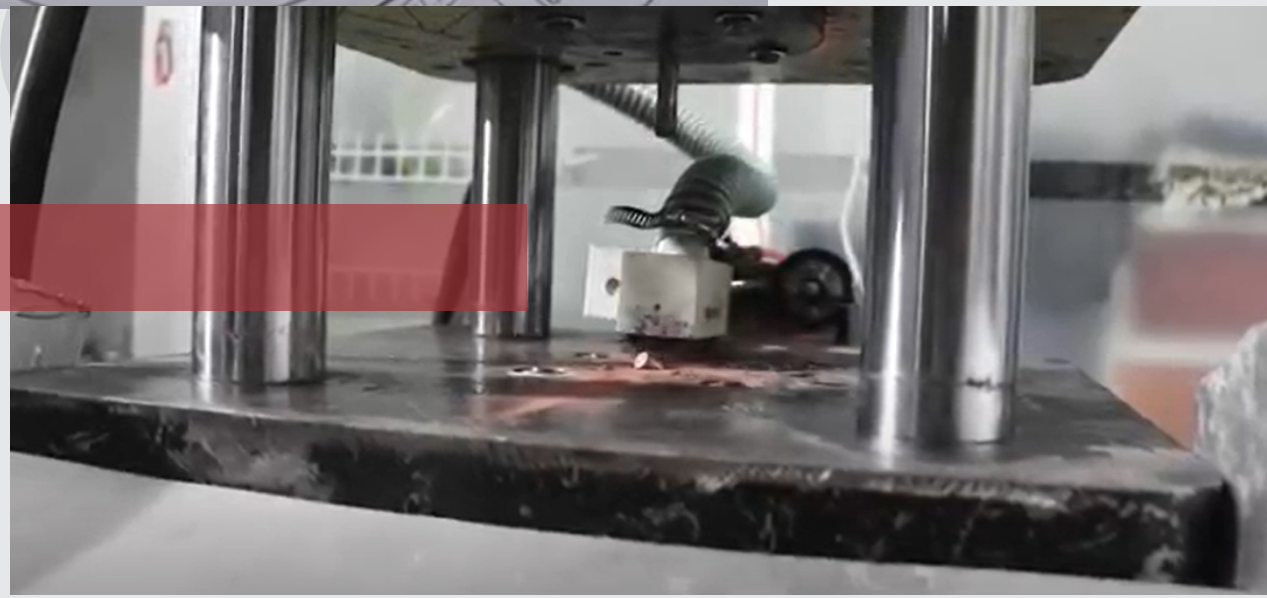
LPDP-funded Bullet Research

A.
Frangible bullet development based composite material
(2017-2018)

B.
Frangible bullet Production Line Development
(2019 - 2021)

C.
Frangible bullet based on MMCs dan PMCs
(2021 - 2022)


TES AKURASI



24

Crocodile Hydrofoil

24

Crocodile Hydrofoil

The Croc a sophisticated warship that could turn into three modes at a time. The three modes are submarines, hydrofoil ships, and ordinary ships generally. During the dive, the speed of the vessel can reach 15 knots. In hydrofoil mode, the speed can reach 35 to 45 knots.

Crocodile Hydrofoil Battleship :

- It is a multi-functional ship.
- Using the hydrofoil system, the ship can travel at speeds of up to 40 knots.
- Adopt the submarine system to avoid the enemy.
- Operating speed when diving 15 knots.

The warship designer, Ir Wisnu Wardhana MSc PhD, said that the current shipbuilding process has reached 90 percent. The ship, which is equipped with two 350 horsepower engines, is quite slim in size, 12 meters long and only 3 meters wide.

According to Wisnu, the ship, which has been designed since 2011, can change into three modes, namely submarines, hydrofoil ships, and ordinary ships in general. "Of course this has succeeded in becoming a new finding in the world of international shipping," claims this Marine Engineering lecturer proudly.

Wisnu explained, a hydrofoil ship itself is a ship that has parts such as wings that are attached to a support under the hull of the ship. When the ship increases its speed, the hydrofoil ship can create a lift that causes the hull to lift up and out of the water. "So the ship looks like it's floating," he added.

Made of aluminum, said Wisnu, the ship has been designed to have a light weight so that it can float, while the wings themselves are made of carbon steel. When used as a submarine, water is introduced into the ship to lower the ship's position. "The depth can reach ten meters," he said.

When diving, continued Wisnu, the speed of this ship can reach 15 knots. While in hydrofoil mode, the speed can reach 35 to 45 knots. Wisnu revealed that this ship is suitable for use as a reconnaissance ship that can be used to catch fish thieves in Indonesian waters.

The reason, said Vishnu, is that the fishing boat thief will not know the arrival of this warship when it is in diving mode, so that the tie thief will not run away when The Croc arrives. In the manufacturing process, Wisnu also collaborated with the Indonesian National Army – Navy (TNI-AL), the Ministry of Research and Technology (Kemenristek), and several other parties.

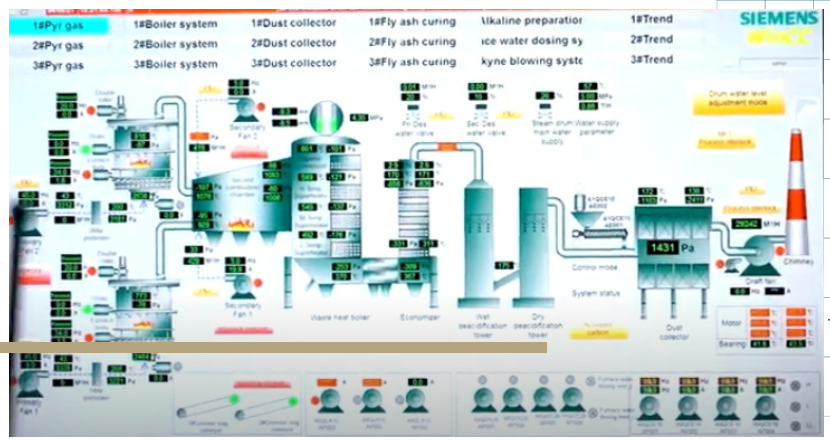
It is hoped that The Croc as a domestically made warship can help in maintaining the defense and security of the Unitary State of the Republic of Indonesia (NKRI).Such as smuggling or theft that often occurs in Indonesian waters.

25

Waste to Electrical Energy Processing (PSEL)

25

Waste to Electrical Energy Processing (PSEL)

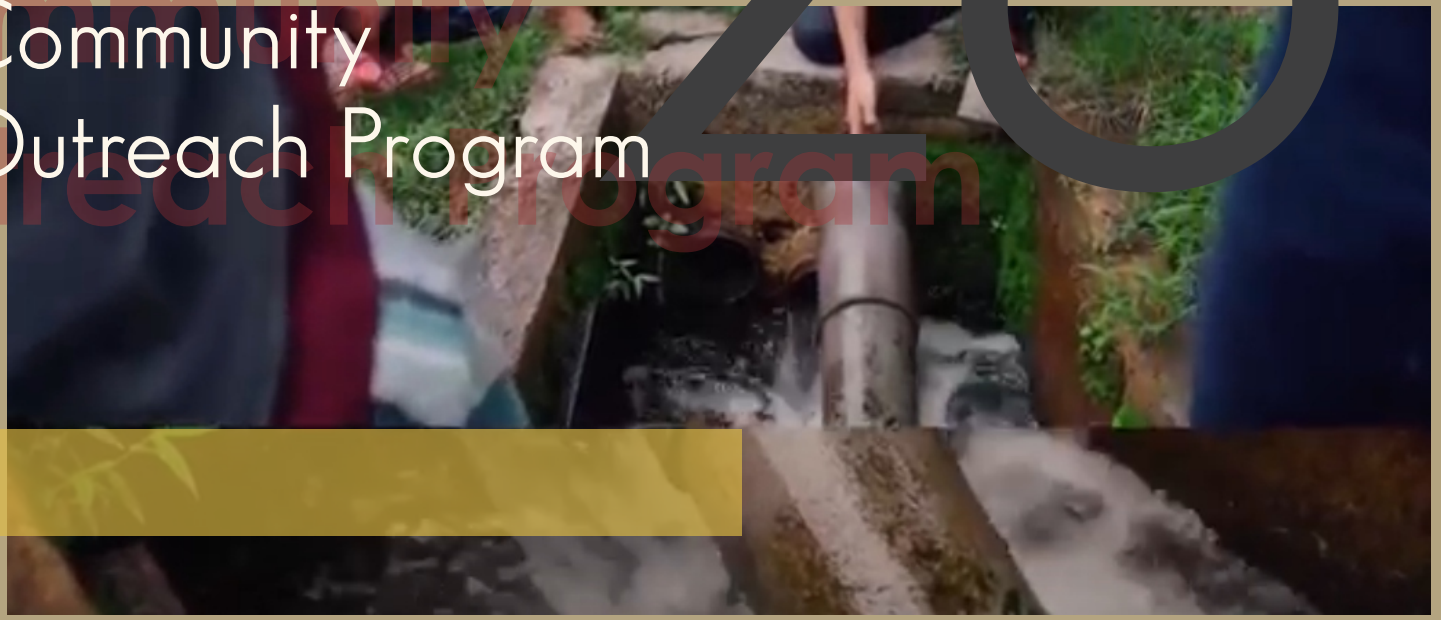


The first power plant project from waste in Indonesia with gasification technology using the PPP scheme has been inaugurated by President Joko Widodo on May 6, 2021. This Waste to Electrical Energy Processing (PSEL) produces a total of 11 MW of electricity which is opened to PLN. The ITS team behind the Surabaya City Government has been involved since 2010 to realize this project. Of the 7 major cities in Indonesia assigned by the President, only Surabaya was able to complete the task until it became what it is today.

Waste to Electrical Energy Processing (PSEL)

26

Students Community Outreach Program



26

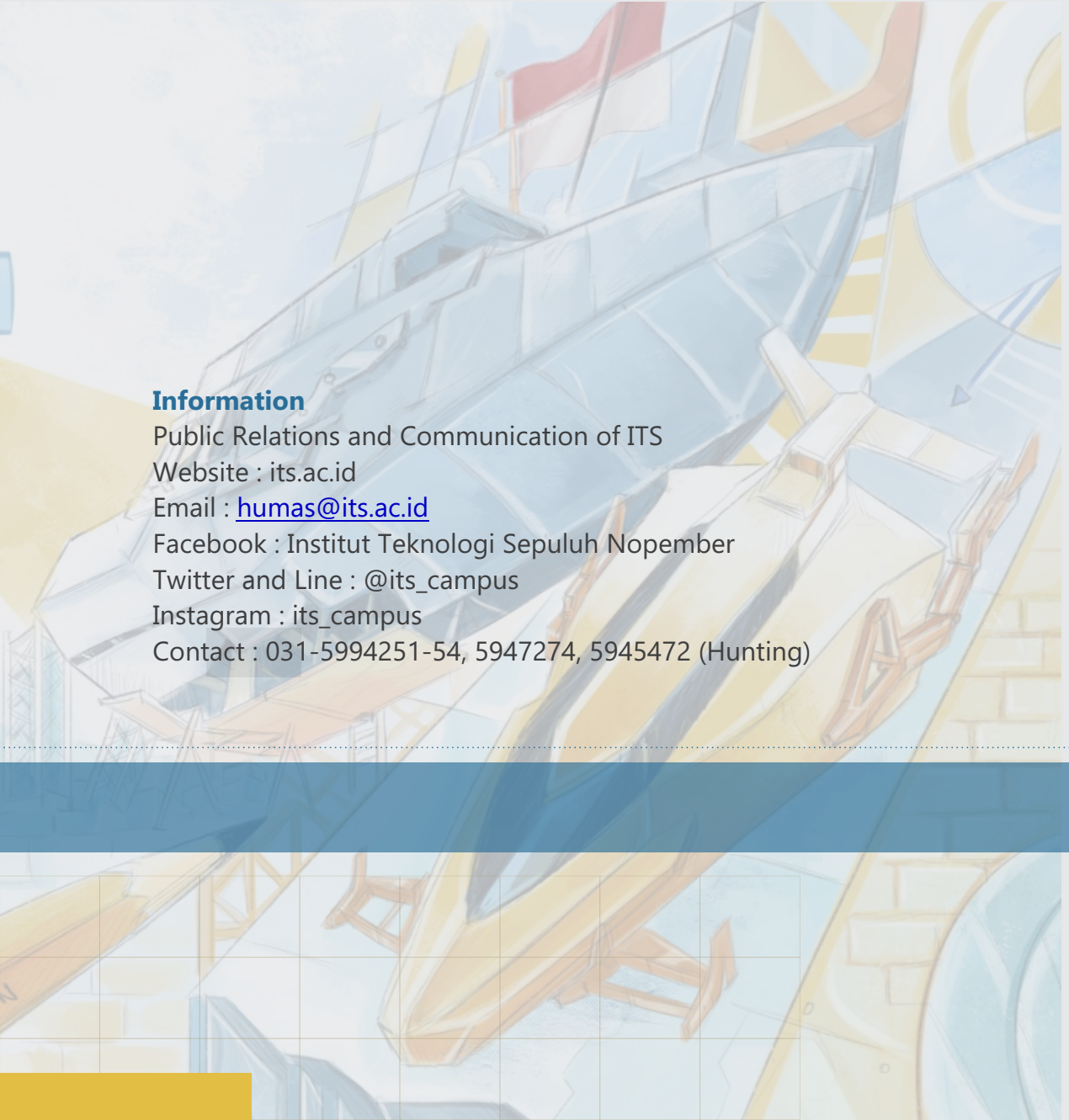
Students Community Outreach Program

Students Community Outreach Program at ITS has been started a long time ago, but stopped in 1989. Given the importance of this activity to become a life learning laboratory in the midst of society. As an extension of ITS in helping to solve problems faced by the community. So since 2019, the implementation of KKN at ITS has been revived.

Students Community Outreach Program is expected to increase student empathy and concern as well as apply science and technology in teamwork and interdisciplinarity. Thus, Students Community Outreach Program functions as a learning medium, as well as a means of service and a means of introducing ITS to the wider community.

in collaboration with University of Stuttgart


Perhangan
Industri



Information

Public Relations and Communication of ITS
Website : its.ac.id
Email : humas@its.ac.id
Facebook : Institut Teknologi Sepuluh Nopember
Twitter and Line : @its_campus
Instagram : its_campus
Contact : 031-5994251-54, 5947274, 5945472 (Hunting)