

# NERDC NEWS

*Newsletter of National Engineering Research and Development Centre of Sri Lanka*



## Inside this ..

*Coir braiding machine/ Abrasive wheel testing facility*

PAGE 02

NERDC owned new patents

PAGE 03

Artificial cooling/ Internal Presentation/ Research Fellow

PAGE 04 / PAGE 05

Technology Clinic for SMEs / "Sekkuwa" - Ancient technology

PAGE 06

NERDC Technology transfers

PAGE 07

NERS 2021

PAGE 08

## NERDC Small Bridge Technology to replace tree trunk bridges "Edanda"

One of the major backlogs in the social & economic development of rural areas in Sri Lanka is a road system with limited accessibility. It is made worse by the lack of safe canal crossings, and the existing poor roads are channeled to rural villages. Many villagers in rural areas are farmers, and they frequently face enormous difficulties in transporting their harvests and other agricultural products to towns or market places located closest to them. Children in these areas are unable to attend their schools during the rainy season due to rising water levels in rivers & water canals. Because the villagers do not have proper crossing roads, they use non-standard tree trunk bridges for crossing water paths. These bridges are commonly known as "Edanda", which is an extremely unsafe means of crossing canals. Typically, it disappears after heavy floods. If it remains, it has to be replaced regularly. The National Engineering Research and Development Centre introduced a small bridge with a span of up to 30 feet and a width of 7 feet, which facilitates transportation for motorcycles, three-wheelers, small lorries, cars, and small vans. The NERDC introduced this technology as a result of a deep survey conducted on the usage of traditional "Edanda" and continuous research carried out on cost-effective small bridge construction technology. The NERDC has already constructed 20 small bridges all over the country as a pilot commercial project and the feedback from the villagers is being observed. The use of NERDC Cost Effective Small Bridge Construction Technology in developing the transport systems of rural communities will lead to an increase in national domestic production whilst improving the living standards of these communities.

## “An Abrasive Wheel Performance Testing procedure & facility”

For the first time at NERDC, engineers working in the Development Projects Department, have established testing procedures and testing benches for performance testing of cutting and grinding wheels of 4”, 4.5” and 14” sizes. This was accomplished under the guidance of DG and DDG (Services), upon the request of Arpico Durables (Pvt) Ltd.

The total number of 42 wheels were tested and relevant comparison tables and graphs were prepared in test report format. Scope of testing includes the diametric wear, weight wear, cutting/grinding speed and cutting/grinding power consumption. The results are compatible with the relevant literature followed and hence produced report results were merely acceptable for further analysis and decision making. This new experience & the exposure enables NERDC to continue abrasive wheel testing for outside customers, as another value added service provided to the industry.

## NERDC introduces a machine to improve the braiding process in the coir industry: A New Coir Braiding Machine

The Sri Lankan coconut coir-based products are another major foreign exchange earner in Sri Lankan economy. Various handmade mats made of braided coir are among the most popular products in many developed countries. However, the process of manufacturing of such mats is highly labor intensive & low productive due to lack of efficient machines. Nevertheless, due to the high demand of such items, it is a widespread cottage industry, where many people are involved and benefited.

Addressing this issue, NERDC has developed an automated machine for braiding coconut coir, which is flat in shape and ideal for many coir products, including door mats, table mats, decoration items, etc. Continuous testing in the industry has proven the quality of the "Coir Braiding Machine" in terms of safety and efficiency. Moreover, the low operation & maintenance cost is another advantage of this machine. With the option of possibility of regulating the braid pitch, the machine can produce uniform flat ropes, which is impossible even for a skilled laborer. Dimensions of the machine are 900mmx600mmx1450mm (LXWXH) in size and the total weight of the machine is 110 kg. The capacity of the machine is 20 meters per hour. Usage of this machine would increase their revenue and job satisfaction.



## Contact us

**National Engineering Research and Development Centre  
of Sri Lanka**



2P/17B, IDB Industrial Estate, Ekala,  
Ja-Ela, Sri Lanka.



Telephone – 011-2236384  
011-2236284



E-mail – [nerdcentre@nerdc.lk](mailto:nerdcentre@nerdc.lk)



Web – [www.nerdc.lk](http://www.nerdc.lk)  
<https://www.facebook.com/nerdc.ekala.7>



Fax – 011-2236434, 011-2233153



## NERDC Contributes to Development of National Engineering Arena: Three patents are newly obtained for new innovations

---

NERDC, as the national apex entity in engineering research and development of the country, always seeks ways to contribute to the country's engineering arena by adopting its' all strengths towards innovation of new products, processes or technologies. All of these new innovations are secured by obtaining patents, which provides its owner the legal right to exclude others from making, using or selling of these inventions. During the period of the past seven months NERDC professionals have obtained the patents mentioned below.

### Toe Operated Prosthetic Hand

This prosthetic hand contains 5 individually controlled fingers, with higher degree of freedom to the thumb actuation. It is an innovative solution with a flexible & simple mechanism, easy to operate, cost effective prosthetic hand which can be used by disable people or as an articulated hand for humanoid robots. This solves the issues of many prosthetic hands produced today, such as inability to control the fingers of the hand and huge cost involved. **This was invented by CEng. A.A.S.P. Jayasinghe and granted patent number 19590.**

### Compact facility for treatment of waste water in automobile service stations

Wastewater generated in automobile service stations contains chemicals, oil, grease and other petroleum based pollutants. Further these wastewater treatment plants available in automobile service stations use hazardous chemicals for treatment, and the disposal of sludge containing chemicals pollutes the environment. Due to the large land area requirement for existing water treatment plants these issues create detrimental effects on every aspect of the environment, especially in urban areas. By eliminating above issues, NERDC has developed an effective compact type treatment system without chemical usage for wastewater generated in automobile service stations. **This was invented by Eng. N.P.T. Perera and Mrs. P.M.G. Pathiraja & granted patent number 18904.**

### Fertilizer Applicator for coconut trees

Fertilization of coconut trees is a time consuming and labour intensive process, which has become a huge issue in coconut plantations due to high time-consuming. NERDC has developed a fertilizer applicator, which is operated by two-wheel tractor providing a fine solution for current issues arisen in coconut plantations due to labour scarcity, low efficiency, high wastage of fertilizer and unavailability of suitable appropriate technology to use. **This was invented by CEng. S.A.P.S. Silva and granted patent number 17978.**

## Another service by the NERDC

---

At the request of the industry, NERDC engineers designed and manufactured a manually operated soap cutter. The requirement was to cut raw toilet soap bars into pieces for the following soap stamping and packing. The cutting length of soap pieces can be adjusted to a range of 10-100mm. This is yet another valuable service provided by the NERDC to the industry's needs.



## Artificial Cooling and Refrigeration

Cooling is a natural phenomenon which is around us. As an example, rain, snow, lakes, rivers, and shades of trees; provides cool environment on earth. Nevertheless, sweating, and urinating processes in human beings and animals cause the body temperature to cool down as it removes heat. All these are natural cooling systems.

Refrigeration and air conditioning are the artificial or man-made cooling systems which were developed based on natural systems that have a great history. Literature says that hunters in China have first noticed the animal carcass which remained unspoiled so many days under the snow during winter; then, around 500BC ice caves were used to store food to protect them from spoilage. Later, ice cubes with sawdust were used for beverage cooling in wooden cupboards. The first vapor compression refrigerator was invented by Jacob Perkin in 1834. In 1927, General Electric was one of the major companies in US which has started to manufacture refrigerators for domestic use. Later, there was a gradual development of refrigerator up to now.

Refrigerator is specifically designed for retaining a coolant or cooling agent in a confined space to cool predefined space, while air conditioner was designed to project cool air away from the unit to an undefined room space as shown in Figure 1



Figure 1: (a) Refrigerator (b) Air conditioning unit

Refrigerator is one of the very common appliances in today's households mainly for preserving foods. Therefore, correct cooling capacity is one of the key parameters on refrigerators as cool temperature will stop the reaction of food spoiling bacteria. However, air-conditioning is more concerned with human comfort and its cooling ability depends on the environment at which the device is operating.

### Further on Refrigeration

Food spoilage is basically due to the reaction of microorganisms like bacteria and fungus on food. The multiplication of these microorganisms is higher in ambient temperature. When heating the food beyond  $60^{\circ}\text{C}$  these microorganisms will kill as in cooking of foods. Alternatively, if we lower the temperature of the food, the reaction of microorganisms will retardate too. Normally if we cool the food below the minus  $18^{\circ}\text{C}$ , food can be kept long term for more than three months. But if we take them back to room temperature that is between  $4^{\circ}\text{C}$  to  $60^{\circ}\text{C}$  the microorganism's action starts again. Preserving food by cooling is very popular today because cooling can maintain the freshness of the food implying the original color, appearance, and the taste. Domestic refrigerator was designed with essentially two temperature zones called, freezer where temperature can be reduced beyond  $-18^{\circ}\text{C}$ , and fresh food compartment where average temperature is around  $4^{\circ}\text{C}$ . So highly perishable foods like fish, and meat can be stored in freezer while fresh foods like fruits and vegetables can be stored in the fresh food compartment. There are one or two regulators in the refrigerator zones or compartment to adjust the temperature and the cooling rate on them. Continuous maintenance of correct temperature on each of these compartments are very important to control the microorganism's reaction on food by then to avoid food born diseases after consuming them. But some users have the practice of switching off the refrigerator during nighttime to save electrical bill but be aware it might open the door for medical bill.

## Get to know about Research Fellows at NERDC



Eng. E.A. Nandana K. Edirisinghe is a Research Fellow at NERDC and has 27 years of experience as an engineer. He has obtained his BSc. Eng. (Hons) in Chemical and Process Engineering from University of Moratuwa. He obtained his Master of Philosophy at University of Peradeniya and he is a Chartered Engineer.

His area of specialization research & development is industrial applications of biomass gasification and combustion. He engaged in development and implementation of technologies for LP gas cremation and solid waste incineration. 'Testing of biomass gasifier for tea drying', 'Fuel switching from diesel to wood chips in tea drying through a pre furnace with controlled feeding', 'Development of technology for application of Gliricidia wood chips for tea drying', 'Installation and testing of biomass gasifier based power generation system in stand-alone and grid connection' were the major R&D projects he lead the project teams.

The major commercial projects he completed are 'Solid waste incinerator for hospital waste with capacity 150 kg/h' for Colombo North Teaching Hospital (2001) and for Provincial Hospital, Kurunegala (2006).

He has covered the duties as Head of the Department for certain period in Agricultural and Post-Harvest Technology and as Director in Renewable Energy Department. Presently he is engaged in technology development for fish drying with NARA, pyrolyzing of MSW for bio-char production with University of Moratuwa and application of fuel wood chips for tea drying with TRI. He is a co-patent holder for 2 patents.

He also has served as a resource person and shared his expertise with CEA, local governmental authorities and Department of Chemical and Process Engineering of University of Moratuwa.

He has published many research papers and participated as the speaker in many national and international forums. He is a renowned consultant for incineration technology and has served as the Chairman of Research Symposium Committee of NERDC too.

## **“Development of an Efficient Fruit cum Vegetable Grader for Spherical Commodities”- Internal journal club presentation, 27th April 2021**

Opening a new page in NERDC history, the NERDC research fellows have formulated a Journal Club to provide engineers' the exposure and familiarity with technical writing and thereby to increase their confidence & expertise.

There was a journal club discussion among engineers & interested technical staff on “Development of an Efficient Fruit cum Vegetable Grader for Spherical Commodities” by Eng. (Dr.) Nilanthi Fernando on 27th April 2021. Pertaining to the peer learning program, for month of April 2021, the session was conducted, by adhering to the health guidelines imposed by authorities due to Covid-19 pandemic situation. The Senior Management, all engineers and scientists of NERDC actively participated in this session

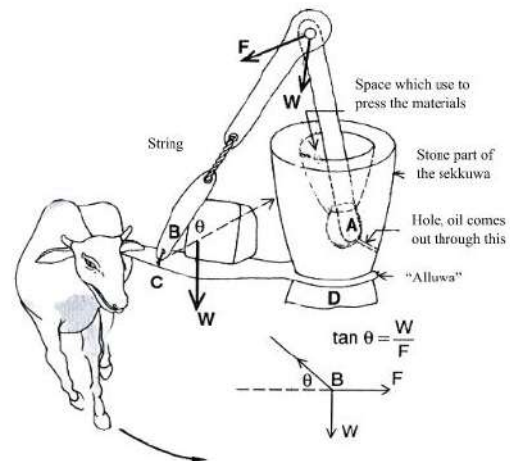


*Eng. (Dr.) Nilanthi Fernando*

## Sekkuwa (Chekku): The traditional coconut oil expeller empowered by traditional engineering technology

This is an instrument made out of stone and wood for expelling cold pressed oil from various nuts & seeds, which is used to be used in countries like Afghanistan, India, Myanmar, Sri Lanka and Sudan. It was widely used in ancient Sri Lankan coastal communities to extract cold pressed coconut oil from scraped coconut kernels and dried small pieces of coconut. Despite the fact that there is no literature on this prior to the colonial era, this equipment is fully compatible with the realm of our ancient engineering technology

Its main body is made out of stone. Let's use the diagram here to get familiar. The (hard) wooden pestle (AO) is rotated in the bottom spherical part (A), and material (from which the oil is to be expelled) is fed from the top into the annular cavity between the pestle and the conical (approximately) cavity of the stone body. When the bull drags the arm CD, due to the weight on it, AO is pressed towards the wall of the cavity and rotated. Due to this motion of AO, the material fed in to the space is pressed and shredded between the pestle and the wall of Sekkuwa.



A schematic diagram of sekkuwa

The material does not go into the spherical part, only the expelled oil is drained into the cavity, and this pure oil is then drained through the small hole to the outside. By keeping a vessel, this oil is collected, cleaned & then packed for consumption. After the oil is extracted, the residual "Poonak" (oil cake) is collected from the top and used for animal fodder.



The Sekkuwa is a very flexible instrument. Due to this flexibility, bull will not get any impact due to a sudden occurrence of hard material. Nowadays, this instrument is hardly used in oil production due to factors such as urbanization, high labor involvement, and the demand for large-scale production for commercial purposes.

## NERDC assists “Technology Clinic” for SME in Matara district

The Vidatha Sector of State Ministry of Rattan, Brass, Pottery, Furniture and Rural Industry has scheduled a series of “Technology Clinic” to be held in each district. The third technology clinic was held at district secretariat office in Matara district aiming at small & medium entrepreneurs (SME), women entrepreneurs and people engaged in cottage industries related to fisheries in the last week of April. Participants were interested in various technologies relevant to cottage industry, solid & liquid waste management, packaging technologies and even for guidance to develop their existing businesses. The total number of participants was over 150 during the session.

## NERDC assists small and medium-sized businesses by creating new licensees through its technology transfer program.

The Technology transfer program at NERDC provides opportunities for small & medium scale entrepreneurs to obtain NERDC technologies, incorporate them into their businesses and thereby increase their capabilities to expand their business opportunities. NERDC has recently transferred six existing technologies to 11 entrepreneurs over the last six months. Out of these, 06 small & medium scale entrepreneurs are registered as new licensees and the other 05 entrepreneurs are existing licensees who have obtained other technologies.

Technology Transferred	Licensee Details
<b>Biogas construction</b>	<ul style="list-style-type: none"> <li>Bio Tech Construction, No 152/1, T.C. Road, Kotikawatta, Angoda</li> </ul>
<b>Cost Effective Building Technology</b>	<ul style="list-style-type: none"> <li>Premadasa &amp; Sons, No. 160, Subadrarama Road, Nugegoda.</li> </ul>
<b>NERDC Improved Cremator with Two Stage Burning System</b>	<ul style="list-style-type: none"> <li>Rathnatunga Construction, No. 105, Kurunduwatta, Wathugedara, Ambalangoda</li> <li>Premadasa &amp; Sons, No. 160, Subadrarama Road, Nugegoda</li> <li>MNG Constructions (Pvt) Ltd. No. 920/2, Siyambalape Watta, Delgoda</li> </ul>
<b>Coconut Oil Extractors (Domestic)</b>	<ul style="list-style-type: none"> <li>Airier Foods, No. 20/15, 2nd Lane, Hospital Road, Maharagama</li> <li>Janitha Traders and Mechanical Engineers(PVT) Ltd., No. 364, Welewatta, wellampitiya</li> <li>Techfield (pvt) Ltd, No 297 Nugegoda Road, Pepiliyana, Boralesgamuwa.</li> <li>Rangana Motors Machinery Designing &amp; Manufacturer(PVT)Ltd. Anuradhapura Road, Daladagama, Ullalapola, Mahawa</li> <li>Isuru Engineering, No 58/D, Kalawana Road, Rathnapura.</li> <li>P.G Nilanka Sanjeewa, Ambagahawatta, Lathpandura, Baduraliya</li> </ul>
<b>Coconut Oil Extractors (Medium)</b>	<ul style="list-style-type: none"> <li>Rangana Motors Machinery Designing &amp; Manufacturer(PVT)Ltd. Anuradhapura Road, Daladagama, Ullalapola, Mahawa</li> </ul>
<b>Coconut Oil Extractors (Hydraulic Jack Operated)</b>	<ul style="list-style-type: none"> <li>Rangana Motors Machinery Designing &amp; Manufacturer(PVT)Ltd. Anuradhapura Road, Daladagama, Ullalapola, Mahawa</li> </ul>



**NERDC**

**National Engineering Research Symposium 2021**

**NERS 2021**

## **Engineering Innovations & Transformative Developments**

11<sup>th</sup> Nov 2021  
@ NERDC

### **CALL FOR PAPERS**

#### **Topics of Interest**

- **Aeronautical & Marine / Mechanical Engineering**
- **Agricultural/ Chemical & Process/ Civil/ Energy & Environmental Engineering**
- **Bio Medical Instrumentation Engineering /Indigenous Technology Development**
- **Electrical / Electronics & Computing /Mechatronics Engineering**
- **Social Aspects /Accounting & Policy Analysis of Technology Development/Technology Transfer**

Paper submission deadline : 22<sup>nd</sup> Aug. 2021

Notification of acceptance : 30<sup>th</sup> Sep. 2021

Camera ready paper submission : 08<sup>th</sup> Oct. 2021

Guidelines & information : [http://nerdc.lk/en/sub\\_pgs/ners2021.html](http://nerdc.lk/en/sub_pgs/ners2021.html)

*The papers  
reviewed & accepted by  
an expert panel, will be  
published on  
NERS 2021 conference  
proceedings &  
@ NERDC website*

#### **Organized by :**

**National Engineering Research and Development Centre**  
**2P/17B, IDB Industrial Estate, Ekala, Ja-Ela,**  
**Sri Lanka.**

#### **Contact**

**E-Mail : [ners@nerdc.lk](mailto:ners@nerdc.lk)**

**Phone : 0765334975/0777878820**

#### **NERDC NEWS TEAM**

##### **Advisory Board**

Prof. Leelananda Rajapaksha  
Eng.D.D. Ananda Namal

##### **Newsletter Committee**

Mrs. D.K. Jayaweera  
Eng. H.P. Hemantha Kumara  
Mrs. P.N. Dilrukshi Pathirana  
Eng. S.M.V.P. Senanayake

##### **Editorial Board**

Dr. A.P.D.Liyanage  
Eng. J.A.A.D. Jayasooriya  
Eng. M.S. Devapura

*National Engineering Research & Development Centre of Sri Lanka*