

PENGHEMAT ENERGI VERTIKAL (VERTICAL ENERGY SAVER)
TAHUN AKADEMIK 2020, 2021 dan 2022



Penjelasan Teknik Cara Kerja Alat Penghemat Energi Vertikal (Vertical Energy Saver) Pada UMKM desa Tanjung Gelam Kabupaten Ogan Ilir pada Tahun 2020.



Serah Terima alat Penghemat Energi vertikal dengan Kades Tanjung Gelam Pada hari Sabtu, tanggal 21 Nopember 2020.

**BERITA ACARA
SERAH TERIMA ALAT
PENGHEMAT ENERGI VERTIKAL**

Pada hari ini,^{Sabtu} tanggal²¹ Nopember Tahun 2020, telah dilakukan penyerahan

Alat Penghemat Energi Vertikal sebanyak 3 (Tiga) Unit pada kegiatan Pengabdian Pada Masyarakat dengan judul:

**ALAT PENGHEMAT ENERGI VERTIKAL
UNTUK PEMANGGANG KEMPLANG DESA TANJUNG GELAM
KECAMATAN INDRALAYA
KABUPATEN OGAN ILIR**

Demikianlah Berita Acara ini dibuat untuk digunakan sebagaimana mestinya.

Tanjung Gelam,Nopember 2020

Yang menyerahkan
Ketua Pelaksana:



Dr. Ir. Darmawi, MT

Penerima,
Kepala Desa Tanjung Gelam:



Nasrullah, S.E.

KEGIATAN PENGABDIAN PADA MASYARAKAT BERUPA PENYERAHAN ALAT PENGHEMAT ENERGI VERTIKAL TAHUN AKADEMIK 2021/2022.



Penyerahan Dua Unit Penghemat Energi Vertikal kepada Kepala Desa Tebing Gerinting Kabupaten Ogan Ilir pada 23 September 2022



Penjelasan Tentang Dampak Pemangangan Kemplang dengan Tungku Terbuka Pada Kegiatan Pengabdian Pada Masyarakat di Desa Tebing Gerinting Tahun 2021.

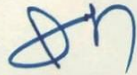
BERITA ACARA
SERAH TERIMA ALAT PENGHEMAT ENERGI VERTIKAL
GENERASI KEDUA KEPADA KEPALA DESA TEBING GERINTING

Pada hari ini Kamis tanggal 23 September 2021, telah dilakukan serah terima **Dua Unit Alat Penghemat Energi Vertikal Generasi Kedua** kepada Kepala Desa Tebing Gerinting Kecamatan Indralaya Selatan untuk diberikan kepada masyarakat pemanggang kemplang yang memerlukan di desa Tebing Gerinting yang berada dibawah pimpinannya.

Serah terima alat ini merupakan bentuk pelaksanaan program Pengabdian Kepada Masyarakat dari Dosen dan Mahasiswa Universitas Sriwijaya dengan judul:
"ALAT PENGHEMAT ENERGI VERTIKAL GENERASI KEDUA UNTUK PEMANGGANG KEMPLANG
DESA TEBING GERINTING KECAMATAN INDRALAYA KABUPATEN OGAN ILIR"
Demikianlah berita acara ini dibuat dan ditanda tangani.

Pihak yang menyerahkan:

Ketua pelaksana PPM:



Dr. Ir. Darmawi Bayin, MT

Pihak yang menerima,

Kepala Desa Tebing Gerinting:





REPUBLIK INDONESIA
KEMENTERIAN HUKUM DAN HAK ASASI MANUSIA

SERTIFIKAT PATEN

Menteri Hukum dan Hak Asasi Manusia atas nama Negara Republik Indonesia berdasarkan Undang-Undang Nomor 13 Tahun 2016 tentang Paten, memberikan hak atas Paten kepada:

Nama dan Alamat Pemegang Paten : SENTRA HKI UNSRI
Jl. Raya Palerimbang-Prabumulih Km. 32 Inderalaya,
Kab. Ogan Ilir, Palembang 30662

Untuk Invensi dengan Judul : PENGHEMAT ENERGI VERTIKAL

Inventor : Dr. Ir. Darmawi, MT

Tanggal Penerimaan : 19 Januari 2017

Nomor Paten : IDP000065109

Tanggal Pemberian : 10 Desember 2019

Perlindungan Paten untuk invensi tersebut diberikan untuk selama 20 tahun terhitung sejak Tanggal Penerimaan (Pasal 22 Undang-Undang Nomor 13 Tahun 2016 tentang Paten).

Sertifikat Paten ini dilampiri dengan deskripsi, klaim, abstrak dan gambar (jika ada) dari invensi yang tidak terpisahkan dari sertifikat ini.



a.n. MENTERI HUKUM DAN HAK ASASI MANUSIA
DIREKTUR JENDERAL KEKAYAAN INTELEKTUAL

Dr. Freddy Harris, S.H., LL.M., ACCS.
NIP. 196611181994031001

KESERTAAN VESA-2EA PADA EXPO HASIL PENELITIAN DAN PENGABDIAN UNIVERSITAS SRIWIJAYA TAHUN 2022



KEMENTERIAN PENDIDIKAN, KEBUDAYAAN
RISET, DAN TEKNOLOGI
UNIVERSITAS SRIWIJAYA
LEMBAGA PENELITIAN DAN PENGABDIAN KEPADA MASYARAKAT
Jalan Raya Palembang – Prabumulih KM. 32 Indralaya Kabupaten Ogan Ilir 30662
Telepon dan Faksimile (0711) 581077
Laman : lppm.unsri.ac.id Surel : lppm@unsri.ac.id

SURAT KETERANGAN
Nomor : 0002/UN9/KT.LP2M.PT/2023

Yang bertanda tangan di bawah ini:

Nama : Samsuryadi, S.Si., M.Kom., Ph.D.
NIP : 197102041997021003
Jabatan : Ketua LP2M Universitas Sriwijaya

Menerangkan bahwa:

Nama : Dr. Ir. Darmawi, M.T., M.T.
NIP : 195806151987031002
Jabatan : Lektor Kepala/Dosen Fakultas Teknik Universitas Sriwijaya

Telah mengikuti kegiatan Ekspo Hasil Penelitian dan Pengabdian kepada Masyarakat Tahun 2022, yang diselenggarakan oleh LP2M Universitas Sriwijaya pada tanggal 5 s.d. 10 Desember 2022 di Gedung Graha Sriwijaya, Universitas Sriwijaya Kampus Palembang. Produk yang dipamerkan:

No.	Nama Produk	No. Hak Paten
1.	Vertical Energy Saver - 2 (VESA-2)	IDP000065109
2.	Mesin Pemipih Purun Generasi Kedua (MPP GEN-2)	IDP000065110

Demikian surat keterangan ini dibuat dengan sebenarnya untuk dipergunakan semestinya.



Tembusan Yth. :
1. Rektor (sebagai laporan)
2. Wakil Rektor Bidang Akademik
Universitas Sriwijaya

PENGHEMAT ENERGI VERTIKAL (VESA-2EA)

A. Deskripsi

PROTOTYPE HAK PATEN VESA-2EA

Nomor Hak Paten: IDP000065109
Masa Perlindungan hingga 10 Desember 2039
Inventor: Dr.Ir. Darmawi, MT.,MT

Nama yang tertera pada Sertifikat Paten adalah Penghemat Energi Vertikal yang English-nya kami sebut VERTICAL ENERGY SAVER atau disingkat VESA.

Tujuan utama penciptaan VESA adalah untuk mengahiri pemanggangan yang dilakukan pada tungku terbuka diseluruh Indonesia, guna menghindari exposure emisi gas buang dari tungku, partikulat dan radiasi panas tungku yang berdampak buruk bagi kesehatan manusia.

Vesa telah direkayasakan sebanyak tiga unit pada tahun 2020 dan diberikan ke masyarakat UMKM yang bergerak dibidang kemplang di Desa Tanjung Gelam pada Tahun 2020. Banyak kelemahan dan kekurangan yang kami temukan pada alat yang telah kami sumbangkan kepada masyarakat tersebut yang mendorong kami untuk melakukan perbaikan dan penyempurnaan. Untuk itu pada tahun 2021 telah diberikan kepada masyarakat Desa Tebing Gerinting sebanyak 2 unit VESA, yang karena telah banyak mengalami perubahan dan perbaikan, kami sebut VESA-2.

VESA_2 ini setelah melalui kajian yang mendalam, tidak lebih dari teknologi biasa-biasa saja yang belum mencerminkan kepakaran yang ada pada perguruan tinggi. Oleh sebab itu kami merasa tertantang untuk memberikan keunggulan pada VESA-2 berupa suatu gerakan memanggang yang tidak lagi diperankan oleh tangan manusia, tetapi dilakukan oleh mesin yang bergerak secara elektronik dikendalikan oleh manusia. Dan ini sudah berhasil dibuat dan dipadu-padankan dengan VESA-2 sehingga namanya berubah menjadi VESA-2EA. Keunggulan VESA-2EA adalah sekali panggang delapan kemplang. Tidak satu per-satu.

Kemplang yang akan dihasilkan dari VESA-2EA tidak sama dengan kemplang yang biasa kita kenal. InsyaAllah akan berbeda dalam hal bentuk, ukuran dan komposisi bahan bakunya. Tujuannya tidak lain agar VESA-2EA tidak mengambil pangsa pasar kemplang tradisional yang sudah ada, tapi justeru menciptakan segmen pasar yang baru sama sekali ditengah-tengah masyarakat.

VESA-2EA saat ini sedang mencari mitra terpercaya untuk produksi massal.
Hubungi: LPPM Unsri atau langsung ke: 0812-7886884.

b. Poster Pameran VESA-2EA

**PROTOTYPE HAK PATEN
VESA-2EA**



**Patent No: IDP 000065109
Tanggal 10 Desember 2019
Masa berlaku: 19 Januari 2037**



**3 Unit VESA disumbangkan
ke masyarakat Tanjung
Gelam Tahun 2020**



**Dua Unit VESA- 2 disumbangkan
kepada masyarakat Desa
Tebing Gerinting Tahun 2021**



**Dua unit VESA-2EA
Tahun 2022**

2.c. Pengunjung Pameran





Inventor dan Mahasiswa Berpose Bersama

d. Kesan dan Pesan Pengunjung

APRESIASI PENGUNJUNG UNTUK PROTOTYPE HAK PATEN VESA-ZEA INVENTOR: DR.IR.DARMAWI, MT.,MT			
NO.	NAMA / FAKULTAS	👍	KOMENTAR JIKA ADA
1	M. FDI 200	✓	Good sutures!
2	Fathoni/Fatih	✓	Langsung!
3	Fidius Salina	✓	Langut!
4	Dr. Anwar	✓	Pertanyak
5	Melawati	✓	SB
6	Andy A	✓	bagus.
7	Azhari	✓	Bagus
8	Widya	✓	keren!
9	Kalisa	✓	Keren!
10	Achar	✓	Manjap.
11	Vandah Retna	✓	Good!
12	Anika Sari	✓	Good job
13	Dwi Hana Yuliani	✓	Keren
14	ANITA RSI/AM	✓	Keren
15	Ace Bahala	✓	Keren
16	Tambayakur	✓	Worban
17	Aina Cahya Mulya	✓	Manjap. Lengkap
18	Hlooni Yuni Hika	✓	Good!
19	Indri Jauwari	✓	Keren
20	Hanny Malini	✓	Good job
21	ora. umi chotimah, M.Pd., PND	✓	Creative...!
22	Daisy Alharit	✓	Mika
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			

ARTIKEL TERKAIT PENGHEMAT ENERGI VERTIKAL (VESA) PADA SEMINARNASIONAL AVOER 2020

EVALUASI KUALITATIF ALAT PENGHEMAT ENERGI VERTIKAL BAGI USAHA KECIL MIKRO DI DESA TANJUNG GELAM KABUPATEN OGAN ILIR

Darmawi*)**), Riman Sipahutar*), Qomarul Hadi *), Ellyanie*),

*) Dosen Jurusan Teknik Mesin Fakultas Teknik Universitas Sriwijaya

**) Telpon: 0812-7886884 Email: darmawi@unsri.ac.id

ABSTRAK. Telah dilakukan kegiatan Pengabdian Kepada Masyarakat di Desa Tanjung Gelam Kecamatan Indralaya, Kabupaten Ogan Komering Ilir, berupa penerapan Alat Penghemat Energi Vertikal bagi usaha pemanggangan kemplang. Alat ini berfungsi untuk memaksimalkan penggunaan panas yang berasal dari tungku bara api dan menghisap semua asap serta gas rumah kaca yang meliputi CO, CO₂, NO_x, SO_x, PM 2,5 dan PM 10. Serta menyalurkannya kesuatu tempat sehingga si pemanggang terjauh dari menghirup udara dengan cemaran unsur-unsur tersebut. Uji kualitatif ini meliputi kesaksian para pemakai yang telah menggunakan alat ini

dibandingkan dengan ketika tanpa memakai alat ini. Secara umum mereka menyatakan, lebih aman, lebih nyaman, lebih hemat arang kayu dan tidak mengalami pedih dimata.

Kata Kunci: Analisa kualitatif, Penghemat Energi Vertikal, Emisi gas rumah kaca.

1. Latar belakang

Penghemat Energi Vertikal adalah sebuah alat yang dibuat untuk memperbaiki secara teknologi proses produksi pada pemanggangan kemplang di Desa Tanjung Gelam, Kecamatan Indralaya Kabupaten Ogan Ilir. Proses pemanggangan kemplang selama ini dapat dilihat sebagaimana nampak pada Gambar 1a, Gambar 1b dan Gambar 1c.



Gambar 1a. Pemanggangan kemplang tradisional dengan Tungku Bara Api terbuka.



Gambar 1b. Pemanggangan kemplang tradisional dengan Tungku Bara Api terbuka, dimana pemanggang menggunakan pakaian serba tertutup dan stick pemanggangan yang panjang untuk menghindari panas dari tungku.



Gambar 1c Pemanggangan kemplang secara tradisional dimana TBA dihembus dengan kipas angin dan pemanggang agak jauh dari TBA untuk menghindari panas.

Pemanggangan dilakukan pada sebuah Tungku Bara Api (TBA) terbuka yang dihembus dengan sebuah kipas angin, sehingga panas yang timbul pada TBA, begitu juga produk-produk pembakaran yang lain seperti Asap, Emisi Gas buang, Partikulat semuanya menyebar kesekitar TBA. Nampak pada gambar, pemanggang kemplang menggunakan pakaian tangan panjang dan penutup wajah untuk melindungi diri mereka dari panas TBA. Stick pemanggang yang panjang, dengan maksud agar cukup jauh dari TBA.

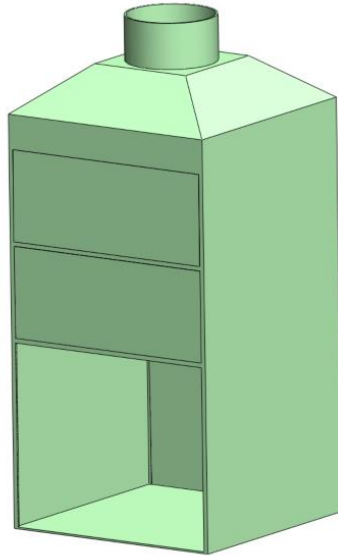
2. Penghemat Energi Vertikal

Penghemat Energi Vertikal adalah sebuah alat yang dirancang untuk mengatasi semua itu. Adapun bentuk dan cara kerja alat tersebut dapat dilihat pada Gambar 2a, Gambar 2b dan Gambar 2c.

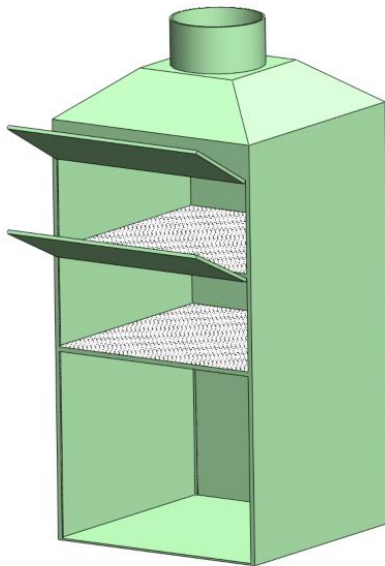
Penghemat Energi Vertikal (PEV), merupakan sebuah alat yang sudah dikuatkan secara hukum berupa Hak Paten dengan Nomor Paten IDP000065109, dengan masa perlindungan hingga 19 Januari 2037

Dengan alat ini, TBA diletakkan pada bagian bawah alat, sementara pada bagian paling atas terdapat sebuah Exhaust Fan yang berfungsi untuk menarik semua gas hasil pembakaran, berikut asap dan partikulat yang dihasilkan dari TBA, serta membuangnya keluar kearah yang dianggap aman bagi manusia disekitarnya.

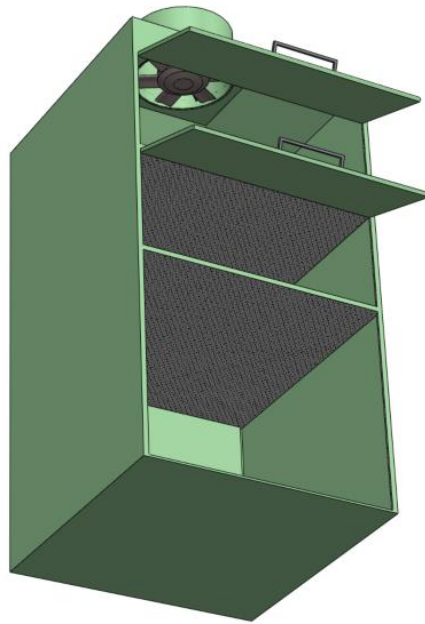
Diatas Tungku Bara Api (TBA), terdapat dua tingkat singgang yang berguna untuk menempatkan barang-barang yang hendak dikeringkan. Misalnya kemplang yang belum dipanggang atau komoditas lainnya yang dianggap perlu dikeringkan. Panas yang digunakan untuk pengeringan ini adalah panas yang berasal dari TBA, sehingga panas tersebut tidak terbuang begitu saja ke atmosfer, tetapi dimanfaatkan terlebih dahulu untuk pengeringan komoditas lain. Pada titik inilah terjadi penghematan, dimana panas dari TBA tidak untuk memanggang kemplang saja tapi juga untuk pengeringan komoditas yang ada di atasnya. Jadi dilakukan ekonomisasi terhadap panas yang dihasilkan dari TBA



Gambar 2a. Alat Penghemat Energi Vertikal (PEV) dengan dua rak pada bagian atas dengan pintu tertutup.



Gambar .2b. Alat Penghemat Energi Vertikal (PEV) dengan dua pintu rak terbuka pada bagian atas.



Gambar 2c. Penghemat Energi Vertikal (PEV) dengan dua rak pada bagian atas, dan pada bagian paling atas terdapat sebuah Exhaust fan yang berfungsi untuk menghisap semua produk pembakaran dari TBA, diantaranya Panas, Asap, Gas CO_x, NO_x, SO_x serta partikulat keatas dan membuangnya keluar ketempat yang dianggap aman bagi manusia.

3. Metode Pengabdian Pada Masyarakat

Kegiatan Pengabdian Pada Masyarakat dilakukan dengan cara memberikan 3 (tiga) unit alat Penghemat Energi Vertikal (PEV) kepada UKM yang bergerak dibidang penjualan kemplang panggangan di desa Tanjung Gelam Kecamatan Indralaya, kabupaten Ogan Ilir, Sumatera Selatan.

Kegiatan ini dilengkapi dengan penjelasan mengenai hal-hal sbb:

1. Cara kerja alat,
2. Hubungan antara alat dengan kesehatan
3. Hubungan antara alat dengan hemat energi dan keuntungan.

Untuk memastikan masyarakat bisa menggunakan alat tersebut dengan benar, maka dilakukan demo penggunaan alat, yang meliputi:

1. Penyalaan TBA yang harus dilakukan diluar alat PEV.
2. Menghidupkan Exhaust Fan pada PEV.
3. Penempatan TBA pada tempat yang sudah ditentukan yaitu pada bagian paling bawah.
4. Memulai kerja pemanggangan kemplang.

Pada kesempatan ini, khalayak sasaran yang dikumpulkan di sebuah tempat, diminta melakukan sendiri pemanggangan kemplang agar merasakan cara penggunaan alat Penghemat Energi Vertikal (PEV).

Pada tahap awal, biasanya selalu memerlukan waktu untuk adaptasi dan penyesuaian. Oleh sebab itu diperlukan kemauan untuk belajar hingga terasa cocok dengan alat ini. Demikianlah, sehingga semuanya mencoba dan merasakan.

5. Hasil dan Pembahasan

Dari pelaksanaan Pengabdian Pada Masyarakat

tersebut didapat hasil-hasil sbb:

1. Terdapat kemauan yang besar dari masyarakat untuk menerima alat ini sebagai suatu bentuk pembaharuan, sebagai suatu perubahan dan langkah maju secara teknologi, khususnya dalam pemangangan kemplang.
2. Terjadi proses adaptasi yang cukup cepat pada ibu-ibu pemanggang kemplang dari kondisi yang tradisional kepada keadaan sekarang.
3. Umumnya mereka menyatakan senang dengan alat Penghemat Energi Vertikal yang ada tersebut, karena memberikan keuntungan-keuntungan dibanding kondisi yang tradisional antara lain:
 - A. Tidak panas, karena panas dari TBA dihisap oleh Exhaust Fan keatas dan dibuang ketempat yang dianggap aman bagi manusia disekitarnya.
 - B. Tidak menyebabkan perih dimata, dimana asap yang ditimbulkan tidak menyebar keberbagai arah seperti pada tungku tradisional dan masuk ke mata.
 - C. Gas-gas emisi seperti CO, CO₂, NO_x, SO_x serta Partikulat Matter yang meliputi PM 2,5 dan PM 10 akan terbuang keluar ketempat yang aman, tidak terhisap oleh pemanggang.
 - D. Panas yang dihasilkan dari TBA tidak hanya untuk proses memanggang tetapi juga untuk mengeringkan komoditi yang ada pada rak diatasnya.

6. Kesimpulan

Dari hasil-hasil yang dicapai tersebut, dapat disimpulkan hal-hal sbb:

1. Masyarakat dapat menerima dan dapat beradaptasi dengan cepat pada alat PEV yang dimasyarakatkan.
2. Panas yang berasal dari TBA dapat dimanfaatkan untuk mengeringkan komoditi yang ada pada rak diatasnya, sehingga terjadi penghematan.
3. Ibu-ibu pemanggang kemplang aman dari menghirup emisi gas buang serta partikulat yang berbahaya bagi kesehatan.
4. Ibu-ibu pemanggang kemplang terhindar dari paparan radiasi panas dari TBA sehingga tidak membahayakan kesehatan terutama kulit.

Ucapan Terima Kasih

Ucapan terima kasih dan apresiasi yang setinggi-tingginya kami ucapkan kepada Fakultas Teknik Universitas Sriwijaya yang telah membiayai acara Pengabdian Kepada Masyarakat ini.

DAFTAR PUSTAKA

Darmawi (2019), Sertifikat Hak Paten, Sentra HKI Unsri, 10 Desember 2019.

Darmawi, Riman Sipahutar, Dewi Puspitasari, Qomarul Hadi, Ellyanie (2020), Alat Penghemat Energi Vertikal Untuk Pemanggang Kemplang Desa Tanjung Gelam Kecamatan Indralaya, Kabupaten Ogan Ilir, Laporan Pengabdian Kepada Masyarakat



Sertifikat

Diberikan Kepada :

Darmawi

Atas Partisipasinya Sebagai:

Pemakalah

Pada seminar Nasional Penelitian dan Pengabdian Masyarakat AVoER XII
Yang Diselenggarakan oleh Fakultas Teknik Universitas Sriwijaya
Palembang, 18-19 November 2020

Dekan Fakultas Teknik
Universitas Sriwijaya



Prof. Ir. Subriyer Nasir, M.S, Ph.D

NIP : 196009091987031004

Ketua Seminar Nasional
AVoER XII

PANITIA SEMINAR NASIONAL
AVoER 12
FAKULTAS TEKNIK UNSRI

Dr. Rosidawani, S.T, M.T

NIP : 197605092000122001



Available online at <http://www.journalijdr.com>



ELECTRONIC ARM FOR VESA-2 REPLACING THE HUMAN HAND ROLE IN KEMPLANG ROASTING PROCESS IN PALEMBANG – INDONESIA

***Darmawi, Riman Sipahutar, Irwin Bizzy and Jimmy D Nasution**

Mechanical Engineering Dept. Lecturers of Engineering Faculty of
Universitas Sriwijaya, Indonesia

ARTICLE INFO

ABSTRACT

Article History:

Received 20th August, 2022

Received in revised form

26th August, 2022

Accepted 13th September, 2022

Published online 30th September,

2022

Key Words:

Roasting, Vesa-2, Kemplang, Electronic arm.

*Corresponding author: Darmawi,

A series of attempt is conducted to minimized the role of human hand in kemplangroasting, the traditional snack of Palembang - South Sumatra, Indonesia. Traditionally, the roasting is perform manually on an open charcoal fire. The negative effect on human health has become the main attentionin this matter regarding the spread of emissions gases, heat emitted and particulates generated. An equipment named PenghematEnergiVertikal (Vertical Energy Saver) or abbreviated as VESA-2 is already developed and improved. VESA-2 is an equipment made to accommodated the heat emitted, the gas and particulates generated from the charcoal stove to be streamed to a place that is safe from human breathand environment. The use of speed controller and switch relay to create reverse rotationand has already successfully imitate the human hand movement to roast kemplang. Geared DC motor is used to get the low output RPM and to facilitate the simple transmission system.

Copyright © 2022, Ana Paula do Nascimento Rocha et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Darmawi, Riman Sipahutar, Irwin Bizzy and Jimmy D Nasution, 2022. "Electronic arm for vesa-2 replacing the human hand role in kemplang roasting process in Palembang – Indonesia", *International Journal of Development Research*, 12, (09), 59296-59299.

INTRODUCTION

The attention to kemplang roasting process has started from the year 2014 in Palembang [1]. Kemplang is roastedon an open charcoal fire as shown in figure 1a,b,c and d. The main problem of traditional open charcoal fire is how to managethe heat emitted, the smoke generated, the exhaust gases and particulates produced, to be accommodated to a place that is safe to human breath and safe to the surrounding environment. The answer has already given by an equipment names VESA-2, i.e. an equipment made to accommodate the heat, the gas, and the particulates generated from the charcoal fire to be distributed to a place that is safe to the people and to thekemplang roasters.VESA-2 is an equipment that has already have patent right created and developed for a better and heathier roasting process in Palembang.

Method of Creating the Electronic Arm of Vesa-2:

In order to replace the hand role of human in roasting the kemplang, we shouldobserve the way kemplang roasted by mothers who use the kemplang as a matter of daily business.Kemplang is roasted by a back and forth motion. One kemplang roasting is completed in 40 seconds to 70 seconds depending on the experience of the mothers who roast it. The roasting movement is imitated by the electronic armas wanted to create.

The first consideration of creating the Electronic Arm is mechanically. It is by modifying the revolution movement of electric motor became the reversal movement by a series of gears installed and linked to the output shaft of motor. This idea looks feasible technologically, but not feasible to constructed. Mainly regarding the weight of construction, the space to reserved, the cost to manufactured and the time to created. So, a set of gears arranged to reduce the RPM and reversed the rotation of motor is not economical and not feasible to realized. The choice is then focused on geared DC motor. This kind of power generation is suitablefor imitating the roasting movement. Voltage of 12V – 24V, low speed, high torque, low powerconsumption, low noise, simple machine structure, easy maintenance and long service life. In order to make VESA-2 a safer equipment, the VESA-2 should completed with an electric tool that can imitate the human hands roasting movements. This tool is we are focusing on in this discussion. We call this tool is an Electronic Arm.To imitate the mothershand movements in kemplangroasting process, at the first time we should learn and understand how to process. The movements of mothers hand when roastingkemplang is reversionary movement i.e. forward and backward movements. The technology of doing this is already available, i.e.small geared motor with controller as indicated in figure 1a and Figure 1b. Basically, the speed controller, is a device which combine the pulse width modulation (PWM) and relay. Relay is used to connect and to break the electric circuit current. The

electromagnet existed in relay will actuate the switch, so the electric of small power can distribute the electric power at higher voltage. In case of motor controller, relay is

used to reverse the direction of motor rotation [6]. Pulse Width Modulation (PWM) is a digital technology that uses the amount of power delivered to a device that can be changed by modifying the width of signal pulse at fixed amplitude and frequency. It generates analogue signals by using a digital source. A PWM signal is basically a square wave which is switched between on and off state.



Figure 1a, 1b, 1c and 1d show mothers roasting kemplang on an open charcoal fire. They use a long stick to prevent heat and wear a thick and long sleeve to protect their body and protect their breath too [2]

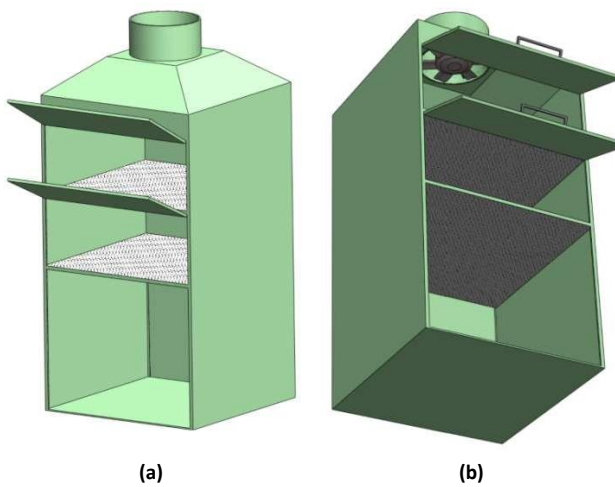


Figure 2a and 2b. Schematic VESA that certified by patent right in 2019 before being developed [3]

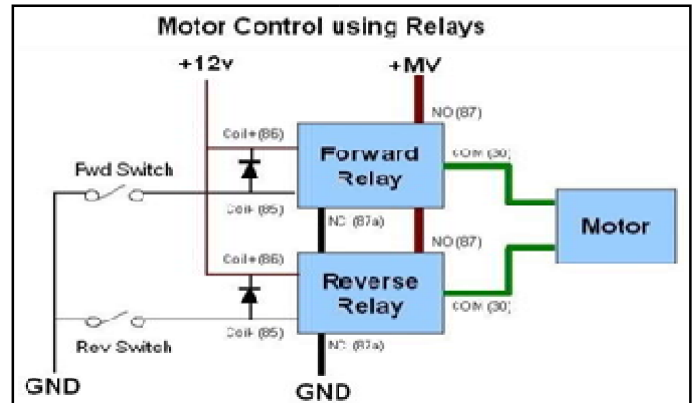


Figure 3a. Motor controller with forward and reverse relay switch [4]

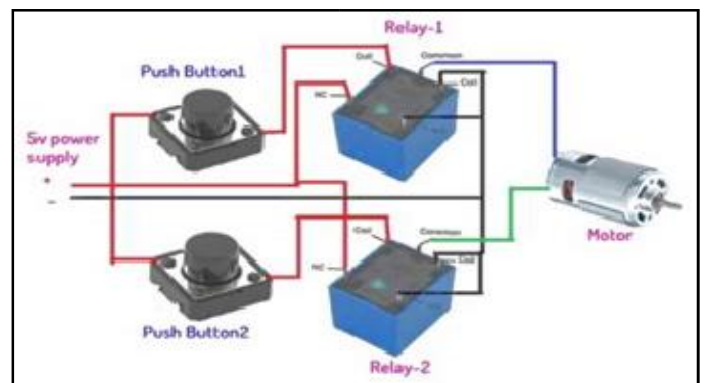


Figure 3b. Motor controller with push button relay [5]

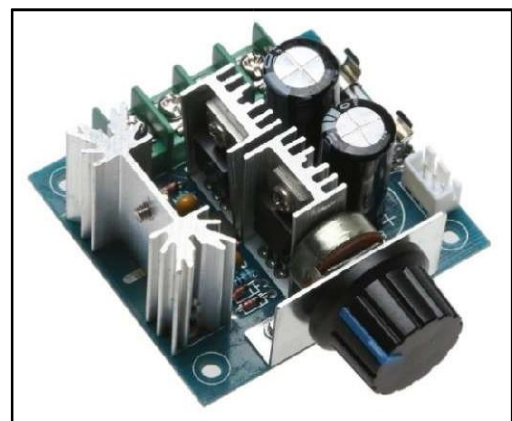


Figure 4. DC Motor Speed Governor PWM Controller DC 12V

24V 30V 40V 13KHZ [8]

A dimmer is a device connected to an electric instrument and used to lower the power supplied to the instrument by changing the voltage waveform, it lowers the power supplied. It lowers the brightness of light, it lowers the revolution of fan blades. [7] The turning switch controller and dimmer is combined on a single board microcontroller, which operating voltage: DC 10V-60V; Current: 0 to 20A; Frequency: 25KHz; Continuous power: Max 1200W

Speed range: Motor zero speed to maximum motor speed. The output current is directly generated for a geared DC motor. The net output rpm of motor is ranging from 60 to 350 rpm, a suitable revolution for the kemplang roasting process. All of these components are available in the market and ready to assemble. Many electric motors are available in the market. Commonly of high RPM ranging from 9000 RPM to 14000 RPM.

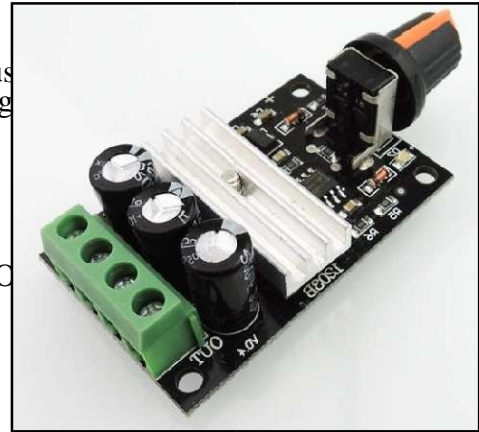


Figure 5. QQ-2: PWM DC 6V – 24V, 3A Motor Speed Control Switch Controller [9]

This rotation much difficult to control by the simple reduction gears. It needs some stages of gear pair that make the constructions not simple. Geared DC motor is applied to facilitate the low RPM and high torque. The high torque is required to hold the roasting arm and to turn it back and forth. Geared DC motor is preferable in order to avoid electrical short and for the safe of operation.

RESULTS

Electronic ARM: The electronic arm is consist of four main parts, controller, DC motor, Transmission system and roasting arm as shown in Figure 6.

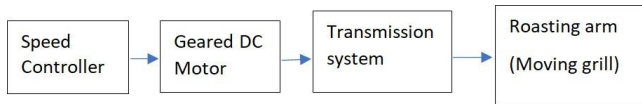


Figure 6. The electronic arm systems is consist of speed controller, Geared DC Motor, Transmission system and Roasting arm

Speed Controller



Figure 7. Speed controller and geared DC motor is packed in a fix box



Figure 8. Speed controller and switch reverse rotation is packed in separated box to the geared DC motor to enable it to operate at a distance

Roasting ARM: Roasting arm is a part of electronic arm system, a place for putting the eight kemplangs inside at once, entirely made of stainless steel. Roasting arm is a hollow circular pipe with four roasting cage crossing the hollow circular pipe. Roasting cages are made of stainless grill net where the kemplangscan put in when the process started and put out when the process completed.

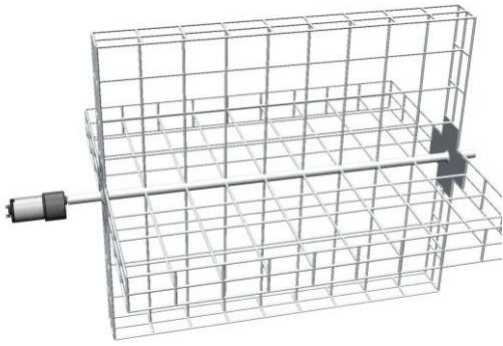


Figure 9. Roasting arm with four roasting cages crossing the shaft

This hollow circular pipe is directly coupled to the DC geared motor and supported at ends at bothsides of VESA-2. Flexible coupling is applied at left end and roll supported at both ends. A tension spring is permanently attached at right end to push the roasting arm shaft to stay connected to the left flexible coupling.

VESA-2EA: VESA-2EA is a VESA-2 that already completed with the Electronic Arm. The final form of VESA-2EA is schematically shown in figure 10. A lift window is existed on top to put in and to put out the not yet roasting kemplang. The main door is a half side of the body, where the roasting arm and the transmission system is attached. A blowing fan is attached at below, to inhale the air from the vicinity and flowing it to the top of VESA-2EA. This air is passed through the charcoal fire and flowing to the top of VESA-2EA and extracted to the atmosphere. Partially, a part of this hot air passing the upper cabin where the not yet roasting kemplang is put in. At this side, the hot from air is used to heat and drying the kemplang to make it ready to roasted.

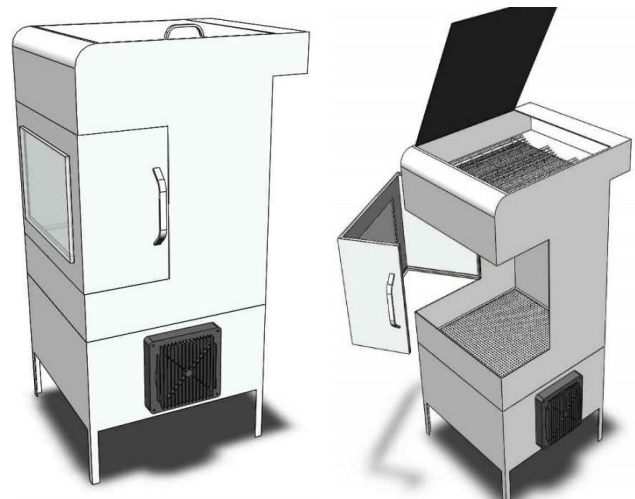
Figure 10. Schematic figure of final VESA-2EA.
[10]

DISCUSSION

From the results found above, we could say that the evolving of technology able to support and facilitate the comfort of human daily life. Electronic arm at VESA-2 is not a finding, but a creativity of knowledge and technology innovation for the sake of health and social welfare. Many things could do with recent technology, but needs capacity to match it to the problems faced by the people. The technology evolving too fast in recent years, it tend to left the people to adapt. [11]

CONCLUSION

1. PWM speed controller and switch relay is a suitable combination to imitate the back and forth movement as done in roasting kemplang.



2. Geared DC motor is used to get the low RPM and high torque motor and facilitate the simple transmission system.
3. The new form of kemplang has already created in order to match with the roasting arm developed in VESA-2.

ACKNOWLEDGEMENT

Many thanks is addressed to the Engineering Faculty of Universitas Sriwijaya, the institution that always push us to creative and produce innovations for the community purposes.

REFERENCES

- Darmawi, Riman Sipahutar, and Jimmy D Nasution, "APLIKASI RANCANG BANGUN ALAT PEMANGGANG KEMPLANG PALEMBANG YANG HEMAT ENERGI, SEHAT DAN HYGIENIS UNTUK USAHA KECIL DI KENTEN PALEMBANG," Palembang, 2014. [Online]. Available: https://docs.google.com/document/d/1-rMqj_QYJBYNqgHdiWbGR2sur_yh7iOW/edit
- M. Dr. Ir.Darmawi, M. Prof.Dr. Riman Sipahutar, ST., M. Qomarul Hadi, ST., and M. Ellyanie, ST., "Alat penghemat energi vertikal untuk pemanggang kemplang desa Tanjung Gelam Kecamatan Indralaya Kabupaten Ogan Ilir," 2020. [Online]. Available: ALAT PENGHEMAT ENERGI VERTIKAL %0AUNTUK PEMANGGANG KEMPLANG DESA TANJUNG GELAM% 0AKECAMATAN INDRALAYA %0AKABUPATEN OGAN ILIR%0A%0A
- D. Darmawi, "Evaluasi Kualitatif Alat Penghemat Energi Vertikal Bagi Usaha Kecil Mikro Di Desa Tanjung Gelam Kabupaten Ogan Komering Ilir," 2020, no. November, p. 4.
- Tri-Pact News Service, "R/C Combat Vehicles Speed Controls," *Open publication*, 2021. <https://www.rctankcombat.com/articles/speed-control/> (accessed Jul. 30, 2022).
- FRIENDTECHBD, "Motor forward reverse control circuit diagram," *Open publication*, 2021. <https://friendtechbd.com/motor-forward-reverse-control-circuit-diagram/> (accessed Jul. 30, 2022).
- Yahoo.com, "6 Fungsi Relay pada Listrik, Ketahui Jenis-jenis dan Cara Kerjanya," *web news*, 2021. <https://id.berita.yahoo.com/6-fungsi-relay-pada-listrik-143032980.html> (accessed Jul. 26, 2022).
- Wikipedia, "Dimmer," *Online page*, 2022. <https://en.wikipedia.org/wiki/Dimmer> (accessed Jul. 27, 2022).
- <https://www.sparkpcb.com/development/12v-40v-10a-pwm-dc-motor-speed-control-board.html>DC Motor Speed Governor PWM Controller DC 12V 24V 30V 40V 13KHZ Auto ...
- [https://electrobist.com/product/pwm-dc-6v-12v-24v-28v-3a-motor-speed-control-switch-controller/PWM DC 6V 12V 24V 28V 3A Motor Speed Control Switch Controller](https://electrobist.com/product/pwm-dc-6v-12v-24v-28v-3a-motor-speed-control-switch-controller/PWM%20DC%206V%2012V%2024V%2028V%203A%20Motor%20Speed%20Control%20Switch%20Controller)
- Jimmy D Nasution, Documented Engineering Drawing for Vesa-2, 2022 (accessed Sept 23,2022). <https://drive.google.com/drive/folders/1a4veYc_9EYv4BuX0-Akw1JqR_II3-BsQ>
- Chris Hooper, Is technology evolving faster than our ability to adapt, web page, June 2, 2015. (accessed Sept.20,2022). <https://www.linkedin.com/pulse/technology-evolving-faster-than-our-ability-adapt-chris-hooper>



RESEARCH ARTICLE

MAJOR CORRECTION FOR VESA-2 REGARDING THE METHOD OF FLOWING THE AIR FROM THE BOTTOM TO THE TOP

Darmawi, Dewi Puspitasari, Ellyanie and Jimmy D Nasution

Lecturer of Mechanical Engineering of Engineering Faculty of Universitas Sriwijaya, Palembang – Indonesia

ARTICLE INFO

Article History:

Received 25th July, 2022

Received in revised form

19th August, 2022

Accepted 14th September, 2022

Published online 20th October,
2022

Keywords:

Vesa-2, Kemplang,

Exhaust Fan, Live Charcoal.

ABSTRACT

A series of measurements and observations have already conducted regarding the temperature distribution and the safety of exhaust fan attached at the top of Vesa-2. Vesa-2 is an equipment created to prevent the exposure of gaseous emissions from the charcoal fire to the people who roast kemplang manually and traditionally in Palembang, South Sumatra Indonesia. The attachment of exhaust fan at the top of Vesa-2 has corrected regarding fluctuating heat resulting from the live charcoal at the bottom. Some reasons has outlined including the uncontrolled volume of charcoal burnt, the amount of air flown, the quality of charcoal and the uniformity of burning. Measurements show the better results and safety for the fan positioned at the bottom. The exit gas temperature and velocity 0.92 m/sec; 45 °C much lower than the application of exhaust fan positioned at the top which 80.15 °C and 3.64 m/sec

Citation: Darmawi, Dewi Puspitasari, Ellyanie and Jimmy D Nasution, 2022. "Major correction for vesa-2 regarding the method of flowing the air from the bottom to the top", *Asian Journal of Science and Technology*, 13, (10), 12219-12222.

Copyright © 2022, Darmawi et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Vesa-2 is an equipment that is used for eliminating the heat, the gases and the particulates that comes out of wood charcoal burning on an open stove. This equipment is required to support Indonesia Maju program by modernizing the kemplang roasting process, from the traditional way as can be seen in many places at present to a more better and healthier way of process. Figures 1a, 1b are the way mothers used to roast the kemplang in Palembang. Kemplang

is a traditional crunchy snack made from a mixture of wheat, egg and fish. This food is liked by most of the people in Palembang. It sold in many places, shops and on the roadsides as presented in Figure 1c and 1d (Darmawi, 2014) Attention has already given to this roasting process since 2014. The main attention is focused on the process of roasting where the gas, the smoke, the heat and particulates emitted from the combustion of open wood charcoal stove. It spreads in all directions, it contaminates the surrounding air and harmful to the breath of mothers and people around it.

The heat, the gas, the smoke and the particulates are harmful to mothers who roast the kemplang by that means. That is the main problems this equipment focused on (Darmawi, 2021) In order to overcome the problems, the first equipment created to eliminate these problems is shown in figure 2, the horizontal energy saver.

***Corresponding author: Darmawi.**

Lecturer of Mechanical Engineering of Engineering Faculty of Universitas Sriwijaya, Palembang – Indonesia.

The wood charcoal stove put at the bottom of the equipment, a small exhaust fan will inhale the gas, the heat, the smoke and the particulates produced by the charcoal at the stove, bring it to the inside of Hesa and flow it to the top and deliver it to the atmosphere. While flowing, the gases will passed through a set of kemplangs arranged to preheat. After that, the gases will delivered to the atmosphere away from mothers breath. This equipment is registered as an intellectual rights at Depkumham RI, in 2016. This equipment is then left behind and not developed (Dr.Ir.Darmawi, 2014). In January 19th, 2017 we create a new equipment named Penghemat Energi Vertikal (Vertical Energy Saver) or we called it VESA. It registered at Depkumham RI and get the patent rights at december 10th, 2019 (Darmawi, 2019). Figure 3, show the schematic figuration of VESA, where the wood charcoal stove put at the bottom of the equipment, while the exhaust fan inhale the air from the bottom to the top and delivered it to the atmosphere. Vesa has already developed and changed in many ways. The developed results called Vesa-2 (Darmawi, 2019). Since the beginning, the heat from the stove at the bottom has been detected as a problem for Vesa-2 with exhaust fan positioned at the top. (5) The exhaust fan suctions the air and force it to flow from the bottom to the top and delivered it to the atmosphere. The fluctuation of heat regarding the uncontrollable amount of wood charcoal burnt is functionally fluctuates the temperature inside the Vesa-2. The relatively high temperature of exit gas of is influenced the performance of the fan and its lifetime in accordance with the low ability of appliances to resist the heat.



(a)



Figure 1. The activity of kemplang roasting and selling manually in Palembang since the age. of decades



(b)



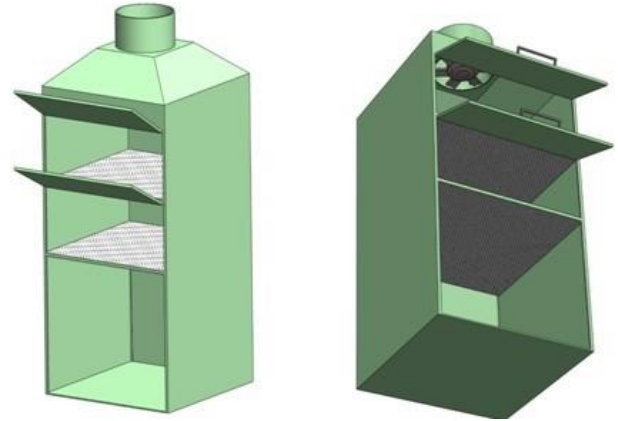
(c)



(d)

Figure 2. Horizontal energy saver(Hesa)

Figure 3. The schematic Vesa-2 with inhale fan at the top



To overcome the problems, the use of steel bladed fan has already tried. But the problems still existed and persisted. The electrical components of fan partially melted and downgraded the fan performance and effectivity. It seems that the principle of air flowing from the bottom to the top should be changed. The basic changed including the mechanism of air flowing, where the current mechanism is the fan inhaled the air from the top of Vesa-2. The alternative mechanism is blowing the air from the bottom to the top. The blowing fan positioned at the bottom of Vesa-2 and blowing as much as $410 \text{ m}^3/\text{hr}$ the air from the bottom to the top of Vesa-2 and delivered the emission gases to the atmosphere at the top outlet gate. Figure 4 shows the distribution of temperature inside the column of Vesa-2 when the air inhaled by the exhaust fan at the top. The average exit temperature is at about 80.15°C . In contrast with the use of blowing fan, installed at the bottom of Vesa-2. The exit temperature and the velocity of emissions flew much lower than the use of exhaust fan. It about 0.92 m/sec in speed and 44.58°C in temperature. This temperature much friendly for the fan of Vesa-2 according to the smooth operation and the long lifetime (Darmawi, 2022)

The method of experiments: To find out the real different of both methods of flowing the air from the bottom to the top of Vesa-2, the experiments and measurements are already conducted. The test is carried out on Vesa-2 with column sizes of $(34 \times 34 \times 110)$ cm and $(36 \times 36 \times 120)$ cm. The quantity of wood charcoal burnt was limited by weight of 1 kg. The measurements carried out three times at each position and conducted at 20 minutes after the uniform burnt of wood charcoal is observed (Darmawi, 2022).

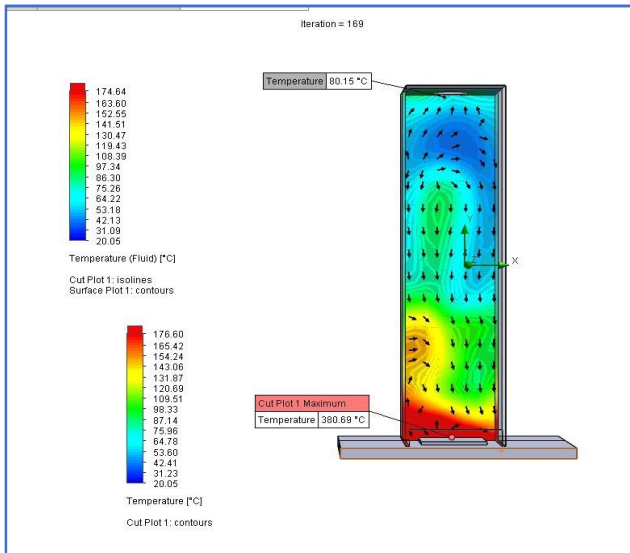


Figure 4. The distribution of temperature inside VESA-2 when the air inhaled from the top



The air box main trusses is made of low carbon steel and the wall of the column surround it is made of alcan sheet of 0.48 mm thick. The air is inhaled from the atmosphere and blew it to the inside of VESA-2 and let it flow through the charcoal stove and ascend the column to the top of Vesa-2 and delivered it back to the atmosphere.

RESULTS AND DISCUSSION

It is very hard to find an exact results of temperature of wood charcoal or even coal briquette, regarding the volume of burnt, the kind of wood made, the quality of process and the size of charcoal itself. It is why the results is an average value of three times measurements of the same position and same location.

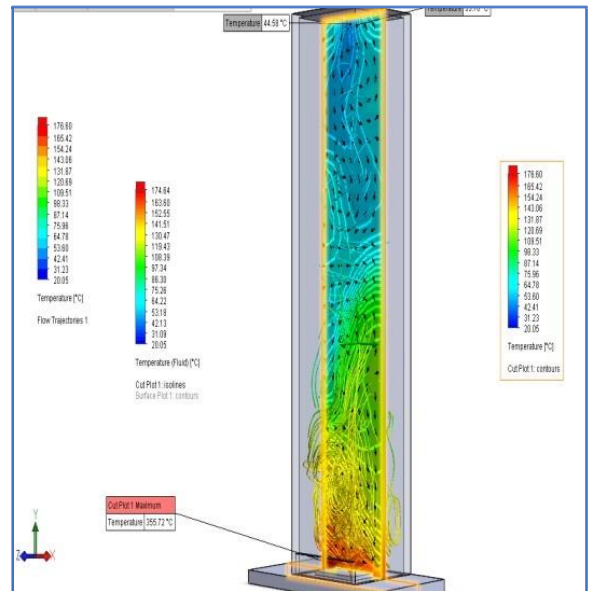


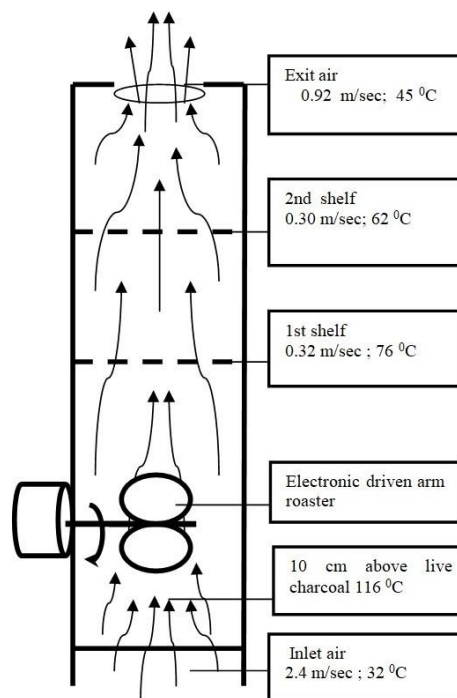
Figure 5. Blowing fans attached at the bottom sides of Vesa-2 to flow the air from the bottom to the top

Figure 6. An inline duct fan of steel blades inhale the air from the top of Vesa-2

The air box is constructed as shown in figure 7 can be installed and removed from the bottom of VESA-2 as for the purpose of experiments and measurements.

Figure 6. Temperature distribution inside the column of Vesa-2 with air flown from the bottom to the top by blowing fan positioned at the bottom of Vesa-2

Figure 7. Velocity and temperature profile of the air flowing in the column of VESA-2 when the air is blew from the bottom to the top



The air is then filtered by steel plates with holes positioned as the bottom plate of Vesa-2 to produce a uniform air flow and flowing through the charcoal stove at above it slowly. We found a speed decrement of air flow in the column of Vesa-2 and a decrement of exhaust temperature as well. The roof top of Vesa-2 is made horizontal, no angle formed at the exit part of Vesa-2. The form of this kind regarded as has influenced to the distribution of temperature inside the column. The temperature tend to uniform at all part of the inside of Vesa-2 after ninety minutes of burning (Juhan, 2016). This matter will considered when decisions of shape and final construction size of Vesa-2 should made. From the previous experiments of wood charcoal burning that has conducted five times in Vesa- 2, no problems found at the blowing fan when it attached at the below side of Vesa-2. From the experiments and measurements carried out, the using of blowing fan at the bottom of Vesa-2 gives some advantages compared to the use of exhaust fan positioned at the top of Vesa-2. The advantages areas the the followings:

- The exit temperature is in the range of 42°C – 45°C much lower than using the suction fan positioned at the top where the exit temperature ranging from 78.12°C – 80.15°C.
- The average speed of flowing air in the column of Vesa-2 is 0.92 m/sec about three-quarter lower than using the exhaust fan positioned at the same outlet diameter.
- The observation shows the quantity of fly ash particles suspended in the exhaust gases significantly decrease by using blowing fan.
- The experiments show that single blowing fan is enough to supply air to maintain the charcoal fire. The blowing fan supplied about 110 m³/hour air supplied from the atmosphere to pass through the Vesa-2

CONCLUSION

From the results of the experiments and measurements, we can withdraw the following conclusions:

- The use of blowing fan, positioned at the bottom of the Vesa-2 is more advantages than using exhaust fan positioned at the top of Vesa-2 mainly according to the speed and the temperature of exit air flow.
- The use of wood charcoal is better than the use of coal briquette for Vesa-2 considering the gas emissions, the cost of productions and the health of mothers kemplang roasters.
- The size of Vesa-2 of (36x36x120) cm shows a better performance in heat absorbance and calorie utilization in Vesa-2 rather than (34x34x110) cm.

Acknowledgement

Many thanks is aimed at the Universitas Sriwijaya, the institution that has support this research financially. Authors hoping that this research give small contribution for the country and for the humanity.

REFERENCES

- Darmawi, Riman Sipahutar, and Jimmy D Nasution, “Aplikasi rancang bangun alat pemanggang kemplang Palembang yang hemat energi, sehat dan higienis untuk usaha kecil di Kenten Palembang” Palembang, 2014. (Online). Available: https://docs.google.com/document/d/1-rMqj_QYJBYNqgHdiWbGR2sur_yh7iOW/edit
- Darmawi, Qomarul Hadi, Ellyanie, and Irwin Bizzy, “Alat penghemat energi vertikal generasi kedua untuk pemanggang kemplang desa Tebing Gerinting Kecamatan Indralaya Kabupaten Ogan Ilir” Palembang, 2021. (Online). Available: <https://drive.google.com/file/d/1-cAQZrwx44xU0puziwwEEisjJNLOsh/view>
- Dr. Ir. Darmawi, “Sertifikat Hak Desain Industri: Alat Penghemat Energi Pemanggangan,” IDD0000045081, 2014 (Online). Available: <https://drive.google.com/file/d/1-va5dfqYINCd46w6lac4jrpg8ED0lJxb/view>
- Darmawi, “Sertifikat Hak Paten berjudul: Penghemat Energi Vertikal,” IDP000065109, 2019 (Online). Available: <https://drive.google.com/file/d/1-tlh2uOZKY3w178wDdopLBoKjOskwE41/view?usp=driv esdk>
- Darmawi, Q. Hadi, Ellyanie, and I. Bizzy, “Analisis aliran udara alat penghemat energi vertikal generasi kedua untuk masyarakat Tebing Gerinting kecamatan indralaya selatan kabupaten Ogan Ilir,” *J. Rekayasa Mesin*, vol. 21, no. 2, pp. 75–78, 2021, (Online). Available: <https://jrm.ejournal.unsri.ac.id/index.php/jrm/article/view/156>
- Darmawi, I. Bizzy, J. D. Nasution, and Ellyanie, “Improving the efficiency of Vesa-2 to Maximize the energy utilization”, *International Journal of Scientific and Research Publications*, Volume 12, Issue 10, October 2022
- Darmawi, D. Puspitasari, and Ellyanie, “Penelitian Unggulan Kompetitif Universitas Sriwijaya Tahun 2022, Judul: Penurunan Temperatur Udara Buang Vesa-2 Dengan Metode Udara Hembus dan Penambahan Volume Ruang,” 2022. (Online).

Available:

https://drive.google.com/file/d/1IF74WMIzI3_wMcTwSt2QeZjsLILTemPX/view?usp=drivesdk
Juhan N. and J. Syarif, “Pengaruh sudut atap cerobong terhadap distriusi temperatur pada

ruang pengering bertingkat dan karakteristik perpindahan panas,” *J. Sains dan Teknol. Reaksi*, vol. 6, no. 2, pp. 9–18, 2016, doi: 10.30811/jstr.v6i2.101.
