Miskolc IPW

IV. Sustainable Raw Materials International Project Week

PROCEEDINGS

EFOP-3.6.2-16-2017-00010 "Sustainable Raw Material Management Thematic Network – RING 2017" Project

SZÉCHENYI 2020

MAGYARORSZÁG KORMÁNYA

Európai Unió
Európai Szociális Alap

BEFEKTETÉS A JÖVŐBE

EFOP-3.6.2-16-2017-00010 "Sustainable Raw Material Management Thematic Network – RING 2017" Project

PROCEEDINGS OF THE MISKOLC IPW - IV. SUSTAINABLE RAW MATERIALS INTERNATIONAL PROJECT WEEK 25-27TH NOVEMBER 2020, MISKOLC, HUNGARY

A MISKOLC IPW - IV. FENNTARTHATÓ NYERSANYAG-GAZDÁLKODÁS PROJEKTHÉT KIADVÁNYA 2020. NOVEMBER 25-27. MISKOLC, MAGYARORSZÁG

ISBN of the web published version: https://www.miskolcipw.hu/proceedings/

ISBN 978-963-358-222-0

ISBN of the pendrive publication:

ISBN 978-963-358-223-7

Publisher: Institute of Raw Material Preparation and Process Engineering, University of Miskolc
Address: Hungary, 3515 Miskolc-Egyetemváros
Telephone: +36 46 565 111/ 17-13; *and fax:* +36 46 565 054
E-mail: ejtadmin@uni-miskolc.hu
Web: https://ejt.uni-miskolc.hu/

SZÉCHENYI 2020
MAGYARORSZÁG KORMÁNYA
Európai Unió
Európai Szociális Alap
BEFEKTETÉS A JÖVŐBE

PLENARY LECTURES ABSTRACTS

SESSION PAPERS

Session 1

Session 2

Session 3

Session 4

B41 **Szigony J, Kondor T, Vér Cs:** INNOVATÍV MEGOLDÁSOK, TERMÉSZETES ANYAGOK A FENNTARTHATÓ ÉPÍTÉSZETBEN -SOLAR DECATHLON 2019 pp. 1-9.

B42 **Győrfi A, Jakab A R, Leitol Cs, Kiss T:** MENNYISÉGI VÁLTOZÁSOK EGY LAKOSSÁGI VEGYES SZELEKTÍV HULLADÉKOT KEZELŐ KÉZI VÁLOGATÓMŰBEN pp. 1-7.

B43 **Győrfi A, Rostás A K, Leitol Cs, Kiss T:** HULLADÉKBÓL SZÁRMAZTATOTT TÜZELŐANYAG NEHÉZFÉMTARTALMÁNAK VIZSGÁLATA pp. 1-7.

B44 **Romenda R, Szalai P, Faitli J:** SZABÁLYOS ALAKÚ SZEMCSÉK KÖZEG-ELLENÁLLÁSÁNAK VIZSGÁLATA EGYEDI FEJLESZTÉSŰ LÉGCSATORNÁBAN pp. 1-8.

B45 **Gazdag G, Kondor T, Kokas B, Dolgosné Kovács A:** SZERKEZET OPTIMALIZÁCIÓ pp. 1-7.

Session 5

A51 **Anh L D H, Pásztory Z:** REVIEW OF THE EFFECT OF MOISTURE CONTENT IN THERMAL CONDUCTIVITY OF NATURAL FIBER INSULATING MATERIALS pp. 1-5.

A52 **Karacaoglan G, Halyag N, Mucsi G:** COMPARATIVE INVESTIGATION OF ZEOLITE GRINDING IN STIRRED MEDIA MILL AND PLANETARY BALL MILL pp. 1-10.

A53 **Pásztory Z, Keresztfalvi P:** MOBILEFORESTER AS A NEW INNOVATIVE MEASURING DEVICE IN FORESTRY pp. 1-5.

A54 **Romenda R, Tóth A, Virág Z:** PRIMARY AND SECONDARY MINING POSSIBILITIES OF CRITICAL ELEMENTS OF ELECTRONIC WASTE pp. 1-10.

A55 **Wikurendra E A, Nagy I:** UTILIZATION OF BLACK SOLDIER FLY (HERMETIA ILLUCENS) AS A PROBLEM SOLVE OF ORGANIC SOLID WASTE pp. 1-10.

Session 6

B61 **Juhász H, Kondor T, Dolgosné Kovács A:** ÚJRAHASZNOSÍTOTT NEMZETI IDENTITÁS pp. 1-6.

B62 **Szűcs E, Kondor T, Vér Cs:** PASSZÍV ENERGIATEREK (SDE 19) pp. 1-5.

B63 **Molnár J, Debreczeni Á:** ÁSVÁNYI ÉS MÁS ÉPÍTÉSI EREDETŰ HULLADÉK ANYAGOKBÓL KÉSZÍTETT HŐSZIGETELŐ KOMPOZITOK MŰSZAKI JELLEMZÉSÉNEK NÉHÁNY KÉRDÉSE pp. 1-5.

B64 **Vizvári Z, Győrfi N, Klincsik M, Sári Z, Odry P:** ÚJ MEGKÖZELÍTÉSŰ ELEKTROMOS IMPEDANCIA TOMOGRÁFIÁS REKONSTRUKCIÓS ALGORITMUS VALIDÁLÁSA ELLENÁLLÁS HÁLÓZATON pp. 1-10.

B65 **Vizvári Z, Győrfi N, Klincsik M, Sári Z, Odry P**: ÚJ MEGKÖZELÍTÉSŰ ELEKTROMOS IMPEDANCIA TOMOGRÁFIÁS REKORNSTRUKCIÓS ALGORITMUS VALIDÁLÁSA IMPEDANCIA HÁLÓZATON pp. 1-11.

Session 7

A71 **Novotni A:** THE ROLE OF THE RESEARCH OF WASTE AND BY-PRODUCTS OF WOOD INDUSTRY IN H2020 PROJECTS pp. 1-12.

A72 **Győrfi A, Jakab A R, Leitol Cs, Kiss T:** THE OBSERVATION OF PICKINGS IN A MANUAL SORTING PLANT OF SELECTIVELY COLLECTED MIXED PACKAGING WASTE FROM HOUSEHOLDS pp. 1-8.

A73 **Győrfi A, Leitol Cs, Kiss T, Dolgosné Kovács A:** THE STUDY OF SIZE AND COMPOSITION IN SELECTIVELY COLLECTED MIXED PACKAGING WASTE FROM HOUSEHOLDS pp. 1-9.

A74 **Tahir C, Aktaş N:** SIMULATION AND OPTIMIZATION OF NATURAL GAS SWEETENING PLANT WITH HYSYS 8.0 pp. 1-9.

A75 **Adamik P, Pásztory Z:** MEASUREMENT OF HEAT LOSS IN WOOD STEAMING KILN AND POSSIBILITY TO RECYCLING pp. 1-5.

Session 8

B81 **Bokányi L, Hornyák G, Nagy S, Mádainé Üveges V:** LI-ION AKKUMULÁTOR BIOSZOLUBILIZÁLÁSÁNAK VIZSGÁLATA A. FERROOXIDANS ÉS A. FERRIDURANS BAKTÉRIUMMAL pp. 1-7.

B83 **Varga B, Fodor K:** ECONOMIC STRENGTH – CRITICAL RAW MATERIAL STOCK pp. 1-9.

B84 **Orosz D, Péter Zs:** EXAMINATION OF THE EXPECTED MARKET PRICE OF LITHIUM-BASED BATTERIES CURRENTLY OR IN THE FUTURE ON THE MARKET - MAIN TRENDS pp. 1-8.

B85 **Yanar N:** LIMITATIONS IN PLASTIC RECYCLING, A REVIEW pp. 1-6.

Session 9

A91 **Somfai D, Czakó-Vér K, Suhajda E, Dolgosné Kovács A, Dittrich E:** EXPERIMENTS OF ANAEROB CO-FERMENTATION OF THE BIODEGRADABLE FRACTION OF THE MUNICIPAL SOLID WASTES (BIFMSW) AND SEWAGE SLUDGE(S) pp. 1-5.

A92 **Somfai D, Kósa D, Bicsák L, Suhajda E, Czakó-Vér K, Dolgosné Kovács A, Dittrich E:** MONITORING OF THE BIOLOGICAL ACTIVITY OF A BIOGAS PLANT WITH ENZYME ACTIVITY MEASUREMENTS pp. 1-8.

A93 **Kalcsú Z, Pásztory Z:** THE CIRCULAR ECONOMY AND RECYCLING OF SECONDARY RAW MATERIALS pp. 1-5.

A94 **Börcsök Z, Pásztory Z:** THE ROLE OF LIGNIN PLASTICIZATION IN SOME WOODWORKING PROCESSES pp. 1-11.

A95 **Suhajda E, Somfai D, Czakó-Vér K, Dolgosné Kovács A, Dittrich E:** CO-FERMENTATIONAL AND QUALITY ASSURANCE ROLES OF SEWAGE SLUDGE IN BIOGAS PLANTS pp. 1-5.

Session 10

B101 **Kornfeld Zs:** AZ ÖKOMARKETING LEHETŐSÉGEI, KÖRNYEZETVÉDELMI ELVÁRÁSAI ÉS AKADÁLYAI, AZAZ A FELMERÜLŐ KONTRA PROBLÉMÁK pp. 1-8.

B102 **Szakálosné Mátyás K, Kovács K, Vityi A, Horváth A L:** LOGISZTIKA AZ AGROERDÉSZETBEN pp. 1-7.

B103 **Kornfeld Zs:** A BESZERZÉS ÉRTELMEZÉSE A FAIPARI VÁLLALATOK KÖRÉBEN pp. 1-12.

B104 **Kozák G, Major T:** ORSZÁGOS FELMÉRÉS A MOTORFŰRÉSZ HASZNÁLÓK KÖRÉBEN pp. 1-6.

B105 **Szakálosné M K, Dudás T, Horváth A L:** MAGASAN GÉPESÍTETT EGÉSZSÉGÜGYI FAKITERMELÉSEK ELEMZÉSE pp. 1-9.

Session 11

A111 **Vér Cs, Dolgosné Kovács A:** CHANGES IN THE LEGAL FRAMEWORK OF THE HUNGARIAN WASTE MANAGEMENT PUBLIC SERVICE SYSTEM AND THEIR ORGANIZATIONAL CONSEQUENCES AFTER 2015 pp. 1-9.

A112 **Vér Cs, Dolgosné Kovács A:** FINANCIAL IMPACTS OF THE CENTRALIZATION OF THE HUNGARIAN WASTE MANAGEMENT PUBLIC SERVICE BETWEEN 2016 AND 2020 pp. 1-9.

A113 **Hosakun W, Horváth D, Börcsök Z, Pásztory Z:** INSULATION BOARD MADE OF SAW DUST pp. 1-9.

A114 **Kovács K, Czupy I, Hemida M, Vityi A:** POTENTIAL CONTRIBUTION OF AGROFORESTRY PRACTICES USED IN AGRICULTURAL AREAS pp. 1-7.

A115 **Kornfeld Zs:** ECO-TENDENCIES REGARDING PELLETS pp. 1-10.

Session 12

B121 **Porcsin A, Szakálosné M K:** A HAZAI FEHÉR AKÁC ERDŐTERÜLETEINEK, AZ AKÁCMÉZ MENNYISÉGÉNEK, ILLETVE A MÉHCSALÁDSZÁMOK VÁLTOZÁSÁNAK VIZSGÁLATA 2000-TŐL NAPJAINKIG pp. 1-7.

B122 **Szunyog I, Szombati-Galyas A B:** A BIOMETÁN ÉS A HIDROGÉN HATÁSA A FÖLDGÁZRA BESZABÁLYOZOTT GÁZKÉSZÜLÉKEKBEN pp. 1-10.

B125 **Kóczán Zs:** APPLICABILITY OF AFM IN PAPER RESEARCH pp. 1-8.

Péter Keresztfalvi, Zoltán Pásztory

Innovation Center
University of Sopron
4. Bajcsy Zs. Sopron 9400
keresztfalvi.peter@uni-sopron.hu

MOBILEFORESTER AS A NEW INNOVATIVE MEASURING DEVICE IN FORESTRY

ABSTRACT

Accurate data is a pillar of modern forestry management. These are the only sources of information on the basis of which forest holdings can carry out an efficient management. The data collection is a time and cost consuming task, which emphases the importance to develop effective technologies and devices.

In the last decades different methods have been developed for measuring trees, forest and wood and wood stacks. Taking into consideration the amount and market value of wood, the accuracy of measurement is highly important, as the price is calculated according to the measured amount. Management needs the best and most effective device to do the task. MobileForester is a newly developed high-tech solution, integrating almost all measuring tasks into one digital tool. It measures the tree height and diameter by means of remote sensing. It determines the forest stock with a digital relascope function. The stack parameters are collected easily and the data is stored without data loss. This article explains the functions of the high-tech device for measuring the forest - the most important source of lignocellulose.

Keywords: measurement, MobileForester, digital technology.

1. INTRODUCTION

The MobileForester is revolutionary new, and intelligent measuring device developed by Hungarian WOODSPRING R&D Company. The company was established in 2003 to create new solutions and develop high-tech equipment in forestry and the wood industry. The MobileForester effectively helps foresters measure trees and forests, and also benefits log brokers. This is a multi-functional device for measuring tree height, tree diameter, log volume and forest inventory (Bitterlich relascope). This single piece of equipment replaces all existing instruments used to measure forests. Only the MobileForester forestry measuring device has a laser rangefinder, compass, altimeter, caliper and a Bitterlich-relascope.

The new device provides a very user-friendly surface and creates the digital data during the measurement process. Every data is saved in a file, the file name and metadata (such as location, number or code of forest site and wood species) can be defined by the user at the beginning of the measurement. Using the MobileForester makes the work of foresters much easier and faster. There is no need for post-processing of paper-based data, as the measured values are immediately recorded in digital form. The measurements are recorded by digital techniques, which you can easily download and open in any database software (E.g. Excel). The device also records the GPS coordinates during all surveys.

The MobileForester offers some innovative solutions to make the measurements more precise and effective. The zoom function brings the target close to your eyes and you can

point it easily with the cross hairs. This function is very useful the trees can be more than 40 meters away. The other revolutionary innovative solution is the remote measurement method without touching the tree to measure the breast height diameter. You can save work and time by eliminating walking to the trees and by so your work efficiency can be three to five time higher.

2. FUNCTIONS

2.1 Distance

It measures the distance of individual trees and other objects in the field up to 50 meters and in the best light as far as 70-80 m.

2.2 Tree height

The MobileForester determines the tree height, considering the slope of the ground. The measurement of tree height is possible on both a flat and sloped area. On flat land you measure the distance of the trunk from the where you stand, and then point at the top of the tree. The system calculates the height automatically and after stores the result to a file.
On a sloped area, you measure the distance to the tree, then point at the bottom of the tree and then point the top. This 3point measurement provides you a very accurate result in any field circumstances.

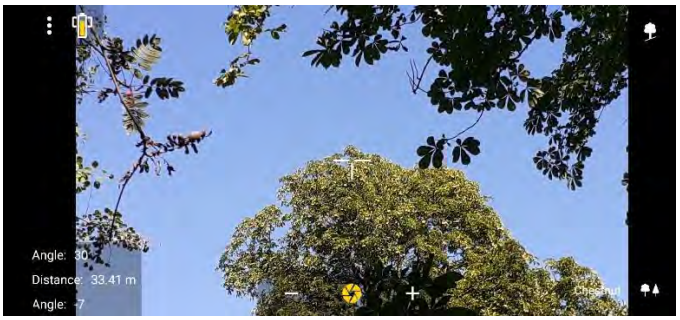

Figure 1.

Measuring tree height

The rapidity and accuracy of the measurement is greatly aided by the zoom function showing the target enlarged on the display. The species are recorded automatically during the measuring. You can choose the species in the beginning from the list but you can modify it during the survey or even add a new one.

2.3. Tree diameter

Traditionally the tree diameter is measured with a caliper, and for this have to go close to the tree which is very time consuming process. The MobileForester makes these measurements from a distance so you don't walk to the tree. The measurement can be made up to 40-50 m, which saves time. First we measure the distance of the tree. The zoom helps precisely aim this function. The device automatically determines the diameter at the height of the measurement. After measuring of the trunk, the app runs an automatic tree diameter measuring algorithm and shows you the results on the screen with two pointer arrows on the two sides of the trunk. If it is not perfect, you can manually modify it by touching the pointer and moving it to the correct place.

Figure 2.

Measuring tree diameter

This method makes the measurement work highly effective. The MobileForester can be fixed on a monopod, which helps to hold the breast height. The built-in leveling display also ensures accuracy.

Figure 3.

MobileForester with monopod

2.4. Timber volume

The valuable logs are measured individually to get a reliable price for the logs which is the base for billing. First we measure the distance of the cut surface from the MobileForester and the system recognizes the circumference of the log automatically. The user measures the circle diameter which is drawn onto the log, or a circle equivalent to the surface, or for an oval log, by fitting an ellipse. Using the butt area and the specified length, the application calculates the volume of the log. The MobileForester offers a circle which can be manually modified, and after acceptance the data is stored in a file.
It is not necessary take the pictures exactly perpendicular to the butt surface, because the device can sense the angle difference on the picture and run the process on a transformed picture. This function can be very useful for logs lying on the ground.

Figure 4.

Timber volume

2.5. Stack solid content

Stacked logs with smaller diameters and lower value are not measured individually but in a stack. This needs an integrated method which can determine the ratio of wood and air space within the stack. The MobileForester has an extra function to determine the solid wood content of the stack. This highly intelligent and complex method offers a very effective and precise solution for traders and sellers of industrial wood, like paper mills, board factories and foresters.

Determining the stack volume is an important and time-consuming task. We save time and money by using the MobileForester to measure stack solid volume. Reducing the potential for error, the device provides precise data, which are reliable for both of the company and the customer.

During the measurement we take a photo of the stack, which can be drawn around with the help of the application. In the resulting image, an algorithm automatically detects the butts. We can correct manually if necessary. From the resulting surface and the length given at the beginning of the measurement, the device calculates the solid volume. Three tables can be retrieved at the end of the process: summary information about the stack, classified data based on log diameter classes, and individual data.

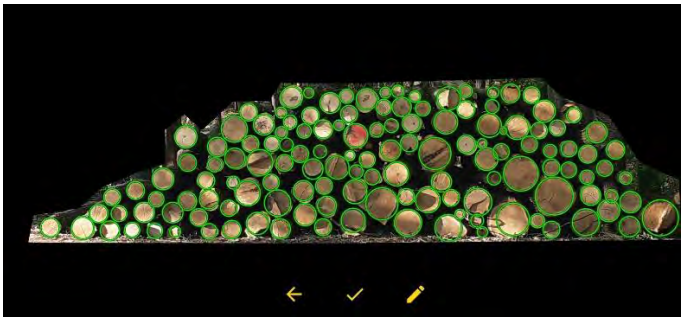

Figure 5.

Stack volume

2.6. Relascope

Multiple measurements of tree diameter in a circle produces the data of forest inventory. Of course this needs the wood species. Using this function, you can estimate the wood volume on the forest site which determines the amount of wood that can be produced. The use of natural resources, like wood, requires conscious, sustainable activity of modern forestry and one of its keystones is precise and effective measurement.

Using a relascope is the most complex task in the forest to determine the living stock of a forest site. This digital technology increases both accuracy and efficiency

You can enter five species in every measuring point. The device saves and displays data while entering data. This eliminates the need to keep anything in mind during the survey. The zoom function greatly contributes to the accuracy of the measurement, since you can easily decide whether the tree fits the selected bandwidth. The MobileForester offers four bandwidths, which provide greater measurement accuracy in thicker or end-use forest sites. The measuring height is assisted by a built-in leveling.
The average tree height and diameter for the circle measurements can also be entered by measurement or estimation. Canopy coverage is given by estimation. The device continuously shows the direction angle so the area can be traversed according to a set plan The application also allows you to view statistics per measuring point.
With the MobileForester, you can measure, file inventory, and map management on a single device. Thus, the device is an active, versatile coworker of foresters.

Figure 6.

Relascope

3. ACKNOWLEDGEMENTS

The work was carried out as part of the „Sustainable Raw Material Management Thematic Network – RING 2017", EFOP-3.6.2-16-2017-00010 project in the framework of the Széchenyi 2020 Program. This project is supported by the European Union, co-financed by the European Social Fund.

4. REFERENCES

1. **Pásztory, Z.; Heizmann, B.; Barbu, M. C.:** "Comparison of Different Stack Measuring methods." Szibirszkij Lesznoj Zsurnal. 2019. No.3. 5-13