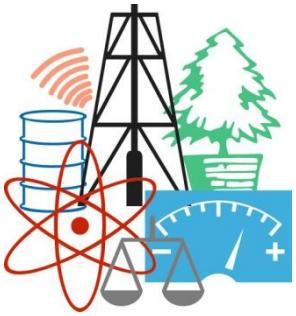
WASTE FORUM



ELECTRONIC PEER-REVIEWED JOURNAL FOR ALL TOPICS OF INDUSTRIAL AND MUNICIPAL ECOLOGY

RECENZOVANÝ ČASOPIS PRO VÝSLEDKY VÝZKUMU A VÝVOJE Z OBLASTI PRŮMYSLOVÉ A KOMUNÁLNÍ EKOLOGIE

YEAR 2015 **No. 3**

Pages 143 – 159

Patron od the issue

CEMC ETVCZ

jediný akreditační orgán v ČR a SR pro ověřování inovativnosti environmentálních technologií a dalších technologií přínosných pro životní prostředí

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WASTE FORUM – recenzovaný časopis pro výsledky výzkumu a vývoje pro průmyslovou a komunální ekologii
ISSN: 1804-0195; www.WasteForum.cz. Vychází čtvrtletně.
Časopis je na Seznamu neimpaktovaných recenzovaných periodik vydávaných v ČR. Vychází od roku 2008.
Ročník 2015, číslo 3
Vydavatel: CEMC – České ekologické manažerské centrum**,** IČO: 45249741, *www.cemc.cz*
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Redakční uzávěrka: 8. 7. 2015. **Vychází:** 15. 9. 2015

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Ondřej Procházka

Editorial

This is the first issue of the journal WASTE FORUM which contains reviewed posts in English. The aim is to increase international readership and to facilitate the inclusion of the journal into international scientific databases, especially into Scopus.

While following the same goal we‘ve added English equivalents of the Czech texts on our website.

At the same time it was decided by the publisher to move the journal onto the portal Tretiruka.cz while the direct access from the address www.wasteforum.cz remains unchanged.

Unfortunately this is not the issue we could be proud of in „Scopus‘sense“since it consists only one peer-reviewed article. Another article received by the editors, was not recommended by the reviewers for publication. So a request for inclusion into Scopus must be postponed. In this context, the question arises whether it is reasonable to reduce the publication frequency to twice a year. This question will be discussed during the autumn meeting of the editorial board.

As you have probably noticed, we've modified the expanded title of the journal on the front page. The expansion from waste management to the whole area of industrial and municipal ecology is another way to acquire new authors to publish in the WASTE FORUM. It is clear the expansion of editorial board will be consequently needed.

Ondřej Procházka

Pro autory

Časopis vychází pouze v elektronické podobě a čísla jsou zveřejňována na volně přístupných internetových stránkách **www.WasteForum.cz**.

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Publikační jazyk byla zatím čeština, slovenština a angličtina. Ve snaze, aby se časopis WASTE FORUM dostal do mezinárodních databází vědeckých časopisů, což je nezbytný předpoklad, aby mohl získat časem i impakt-faktor, bude již od příštího čísla pouze angličtina. V tomto případě však bude nezbytnou součástí článku na konci název, kontakty a abstrakt v českém či slovenském jazyce, přičemž rozsah souhrnu není shora nijak omezen.

Uveřejnění příspěvků v časopisu WASTE FORUM je v zásadě bezplatné. Nicméně abychom příjmově pokryli alespoň nezbytné externí náklady spojené s vydáváním časopisu (poplatky za webhosting, softwarová podpora atd.), vybíráme symbolický poplatek za uveřejnění poděkování grantové agentuře či konstatování, že článek vznikl v rámci řešení určitého projektu. Tento poplatek činí 200 Kč za každou stránku u příspěvků v anglickém jazyce, u ostatních je 500 Kč za stránku.

Uzávěrka dalšího čísla časopisu WASTE FORUM je 8. října 2015, další pak 8. ledna 2016.

FOR AUTHORS

WASTE FORUM is an electronic peer-reviewed journal that primarily publishes original scientific papers from scientific fields focusing on all forms of solid, liquid and gas waste. Topics include waste prevention, waste management and utilization and waste disposal. Other topics of interest are the ecological remediation of old contaminated sites and and topics of industrial and municipal ecology.

WASTE FORUM publishes papers in English. Articles submitted must include a longer abstract in Czech or Slovak language.

Manuscripts for publication in the journal WASTE FORUM should be sent only in **electronic form** to the e-mail address prochazka@cemc.cz or wasteforum@seznam.cz. Manuscripts must be fully formatted (i.e. printer-ready) in MS WORD. The file should have a name that begins with the surname of the first author or the surname of the corresponding author. **Due to the personal connection of the editorial staff with the editors of the professional monthly journal ODPADOVE FORUM, authors need to clearly state that their manuscripts are intended for publication in WASTE FORUM**.

All articles submitted for publication in WASTE FORUM undergo assessment by two independent reviewers. The reviews are dispatched to authors anonymously, i.e. the names of the reviewers are not disclosed to the authors.

All papers that was not subjected to a peer-review are labeled in a header of each page by the text ***Not peer-reviewed and comercial papers.*** Here are accepted papers also in Czech od Slovak language.

Publication of the articles is generally free. However, revenue to cover at least the necessary external costs associated with the issuance of the magazine, we select a symbolic fee for the publication of gratitude grant agency or a statement that the article was created as part of a project solution.. The fee is **200 CZK per each new page for articles reviewed part of issue and CZK 500 for every new page for contributions in the second part of the issue.**

The deadline of the next issue is Oct. 8, more then January 8, 2016.

Gasification of Selected Wastes in Fluidized Bed Reactor

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Abstract

The paper, in its first part, is dealing with a theoretical description of advantages of technology of fluid gasification of waste compared to traditional combustion. The second and main part of the paper is discussing and comparing results of gasification experiments of selected wastes in a generator with circulating fluid layer. The monitored parameters are particularly lower heating value and composition of the produced syngas and the content of tars in the syngas. For the experiments was used a pilot scale device Biofluid at Brno University of Technology.

***Keywords**: waste, gasification, tar, gas, HHV*

Introduction

The Czech Republic produced over 30 million metric tons of waste. More than 5 million metric tons of it represent waste of classification 20 according to Decree no. 381/2001 Coll., i.e. municipal waste. Next, around 150 thousand metric tons of waste represent classification 03: waste from processing wood and manufacturing of planks, furniture, cellulose, paper and paperboard. These two categories of waste have the biggest potential for energy recovery using classification R1 of Annex no. 20 of Decree no. 383/2001 Coll. Yet, for the purpose of energy production was used only about 1 million metric tons of communal waste in the year 2013. That represents about 12 % of total processed communal waste [1]. While energy recovery of waste reduces the total volume of landfill, it is also a significant source of energy. It can partially replace heat and electricity production from traditional sources like fossil fuels. In Czech Republic are in operation three high capacity municipal waste incinerators and over 30 registered facilities for combustion and disposal of waste, including hazardous waste [2].

Therefore, there is a certain space for increase in capacity of the facilities for energy recovery of waste. One of the possible approaches represents traditional municipal waste incinerators. Next to this technology it is also possible to utilize e.g. pyrolysis or gasification, most notably in fluidized bed reactors. Notably, the gasification of biomass has achieved a significant progress in the last twenty years. During gasification, next to oxidation reactions characteristic for combustion at high temperatures (1 500 °C) also appear reduction reactions that are important for breaking of long chains of harmful substances [1]. There are two most important aspects for gasification of municipal solid waste. The first is a very heterogeneous nature of the feed and the second are extensive and stringent regulations of emissions [1].

Waste Gasification

Gasification is a complex thermal and chemical conversion of organic matter in conditions of oxygen deficiency. The result is a low heating value (LHV) of gas (4 MJ/m_n^3 to 15 MJ/m_n^3) formed by a series of simple reactions. The process of gasification usually occurs at higher temperatures, typically between 750 °C and 1000 °C. The produced gas (syngas) is subsequently combusted in boilers or in combustion engines, i.e. combustion turbines. The mains constituents of the produced syngas are the following: CO, CO_2, H_2, CH_4, higher hydrocarbons, N_2, and impurities. The main focus is on the quality

(heating value, composition) and quantity of the syngas generated during the gasification. In addition, the amount of impurities and composition of the syngas are watched.

The resulting composition of the syngas, its LHV and amounts of tars is a result of, next to the composition of gasified feed, a temperature and a pressure in the reactor. The Le Chatelier principle applies here: higher temperatures prefers reactants in exothermic reactions and products of endothermic reactions. This leads to accelerated endothermic reactions and increase of H_2 concentrations and decrease of CH_4 concentrations. The amount of CO depends on the rate of the reaction of partial oxidation of carbon that is an exothermic reaction and thus with increasing temperature decreases. Furthermore, with increasing temperature is reduced the amount of tars in the produced syngas. Long chains are broken into light carbohydrates and in the case of very high temperatures and long reaction time ultimately into hydrogen and carbon dioxide. The influence of pressure has an opposite effect: the syngas produced by high-pressure gasification is characteristic with a high amount of methane. The LHV of the syngas slowly decreases with increasing temperature or is constant. That depends on the composition of the feed.

The option to use the syngas generated by gasification for subsequent power generation is hampered mainly by the problems related to the cleaning of the product. The amount of impurities in the syngas causes operation problems to the units due to clogging and tarring of working surfaces of engines and turbines, which may lead as far as to a serious damage to the equipment under operation. The impurities include most of all dust (airborne solids), alkali compounds, nitrogen compounds, sulfur compounds, compounds of chlorine and fluorine, and tar (i.e. all organic compounds with boiling point above that of benzene that is 80.1 °C) [3]. The amounts of tar and dust are the main factors limiting the use of the syngas as a fuel [1].

In the process of gasification the waste is not considered a fuel (but is referred to as such) but a resource for chemical conversion at high temperatures. Gasification represents a progress compared to combustion, e.g. by higher efficiency of conversion of the feed. In addition, one of the problems with combustion of municipal waste is creation and reformation of toxic dioxins and furans, most notably from PVC. These toxins ends up in the flue gas by three ways. By decomposition, as smaller parts of larger molecules; by “reforming” when smaller molecules combine together; and/or by simply passing through the incinerator without change. Incineration does not allow any control of these processes, and all cleaning of the flue gas occurs after combustion. One of the important advantages of gasification is that the syngas can be cleaned of contaminants prior to its use, eliminating many post-combustion emission control systems required by incineration plants. The clean syngas can be used in reciprocating engines or gas turbines to generate heat and electricity or it can be further processed to produce hydrogen, substitute natural gas, chemicals, fertilizers or transportation fuels, such as ethanol [1]. In general, gasification is significantly different from and cleaner than incineration due to three main factors eliminating dioxins and furans creation a reforming [6]:

1) In the high temperature environment of gasification, larger molecules such as plastics, are completely broken down into the components of syngas, which can be cleaned and processed before any further use;

2) Dioxins and furans need sufficient oxygen to form or re-form, and the oxygen-deficient atmosphere in the gasifier does not provide the environment needed for dioxins and furans to form or reform;

3) Dioxins need fine metal particulates in the exhaust to reform; syngas from gasification is typically cleaned of particulates before being used.

The devices for gasification are thus very suitable for effective and ecological disposal of wastes.

Other author [7, 8] also confirms that in the reduction environment of the gasification reactor is not enough molecular oxygen to produce considerable amounts of dioxins and furans.

Experimental Unit

From 2000 onwards, a research of fluidized bed gasification of biomass and separated municipal waste has been undertaken at the Institute of Power Engineering, Brno University of Technology. The experiments are carried out at a fluidized bed atmospheric gasifier with a stationary fluidized bed called Biofluid (Fig. 1). The control of the gasification process is carried out by changing the fuel to air ratio with temperature control range being within 750 °C to 900 °C. The average heating value of the produced syngas ranges from 4 MJ/m_n^3 to 7 MJ/m_n^3, depending on the fuel used and the operating conditions.

The fuel comes from a rake-equipped storage tank and is fed to the gasifier in batches by a worm conveyor. A blower-compressed air is delivered to the gasifier under its grate as a primary air that is ensuring a partial oxidization of the fuel and maintaining the fluidized bed. Moreover, air can be supplied at two other levels as a secondary air and a tertiary air. Any ash from the gasifier is discharged to an ashbin on an intermittent basis by means of a purpose-designed special moving grate. A simplified diagram of the experimental facility is shown in Fig. 2. A more detailed description is given in, e.g. [2].

The parameters of the gasifier are as follows: Output (in generated gas) 100 kW_t, Fuel consumption max. 40 kg/h, Air flow max. 150 m_n^3/h.

Fig. 1 Atmospheric fluidized bed gasifier Biofluid

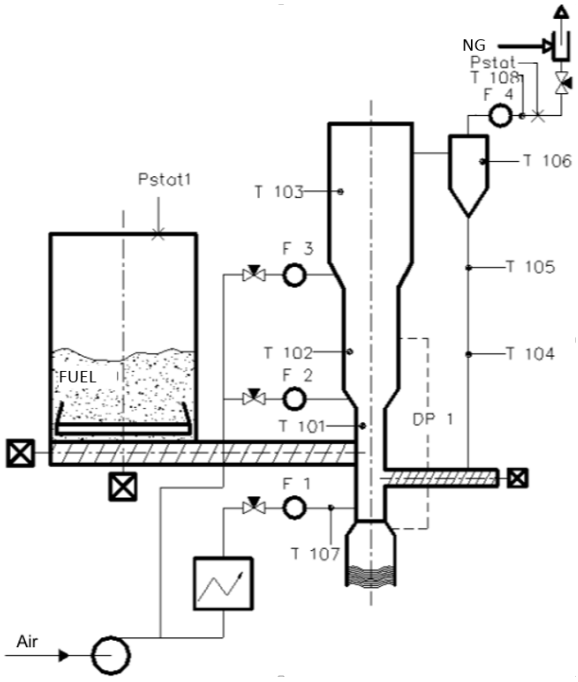

Fig. 2 Simplified layout of the gasifier connections

Measured quantities: *T 101-103…temperatures in the gasifier, T104-105...temperatures under the cyclone, T106...temperature inside the cyclone T107...temperature of the incoming primary air, T108...gas temperature at jacket outlet, F 1-3…air flows, F4...gas flow, Pstat…outlet gas pressure, Pstat1... tank pressure, DP1...fluidized bed pressure difference, NG..natural gas*

Methods of Measurement at Experimental Unit BIOFLUID

The measurement of the syngas quality is usually carried out in two ways. One consists of an on-line monitoring of the syngas composition with a simultaneous gas sampling to gastight glass sample containers. The samples are subsequently analyzed using a gas chromatograph. The tar sampling is carried out in line with the IEA methodology [3] by capturing the tar in a solution that is subsequently analyzed by the gas chromatograph with a mass spectrometer. Presence of HCl, HF and NH_3 in the gas is examined by their trapping in a NaOH solution.

The operating parameters are monitored during the operation and are continuously recorded by a control computer. The operating parameters include, in particular, the mass flow of the fuel, the temperatures at various points of the unit, the pressure difference in the fluidized bed, the gas flow and the pressure and the temperature and the mass flow of the air. A more detailed description is given in [4].

Used fuel

The fuel has a fairly high lower heating value but its composition, water content and overall structure vary. The waste contains a big part of inert material (ashes, debris, soil, etc.) and dangerous materials. The composition of the municipal waste vary on its place of origin (cities, villages, localities with family houses or with blocks of flats) and on the time of year. General fuel characteristics of the municipal waste can be found in the following literature [5, 6].

For a specific testing and observations were used three types of waste. Crushed chipboard, sorted separated municipal waste (SSMW) and a mix of SSMW and wood chips (50/50). Obtained results are then compared with results from gasification of a clean biomass (spruce wood chips). Main characteristics of the fuels are listed in Tab. 1.

Tab. 1 The main characteristics of the used fuels

	SSMW	**SSMW with wood chips**	**Crushed chipboard**	**Spruce wood chips**
	[%wt.]	[%wt.]	[%wt.]	[%wt.]
Volatiles	80,1	77,5	70,4	74,1
Carbon	13,0	13,6	17,4	14,5
Inert materials	5,4	3,3	1,0	0,5
Moisture	1,5	5,6	11,2	11,0
	[%wt.]	[%wt.]	[%wt.]	[%wt.]
C	46,6	45,7	42,6	44,6
H	7,6	6,7	5,7	5,5
O	36,9	37,5	35,8	38,4
N	1,2	0,7	3,6	0,1
total S	0,2	0,1	0,0	0,0
total Cl	0,7	0,4	ND	0,0
	[%wt.]	[%wt.]	[%wt.]	[%wt.]
CaO	1,3	19,4	19,0	43,5
SiO_2	1,5	4,5	15,3	8,5
Al_2O_3	1,1	1,8	7,3	2,7
TiO_2		0,1	25,8	0,2
Cd	< 30		< 10	0,0
Cr	36,0	20,6	170,0	0,1
Hg	1,0	0,6	< 10	0,0
Pb	200,0	114,0	223,0	0,0
As	<30	ND	ND	ND
Se	<50	ND	ND	ND
Lower heating value [MJ/kg]	33,0	25,8	16,1	16,4
Melting point [°C]	1138,0	1138,0	1390,0	1257,0

Notes: ND….Not Determined

Discussion

Although the temperatures of thaw and flow of the ashes of the selected fuels determined at an accredited laboratory achieve values over 1100 °C, sintering of the ashes was the main limiting factor for achieving optimal operating conditions. The objective was to achieve an operating temperature above 800 °C. That was not achieved for any of the fuel containing waste. For the crushed chipboard the optimal operating temperature was determined to be 780 °C. At higher temperatures occurred a significant sintering of the ashes in the reactor that lead to an instability of the entire process. For this reason are for the spruce wood chips listed two sets of values, one for the operating temperature of 780 °C and one for the optimal temperature for wood gasification 820 °C. The AFR (Air-fuel ratio) was maintained in the interval of AFR = 0.3 – 0.4. The sampling of the gas and tars were carried out at a steady state of operation that was maintained for 4 – 6 hours. All of the listed values of the syngas and tars composition are averaged from at least 5 samples. The analysis of these samples was made by workers at University of Chemistry and Technology Prague.

Fig. 3 Composition of the syngas. The horizontal axis represents the selected fuels. The vertical axis represents the main components of the syngas in volume percent.

The comparison of the composition of the syngas shown in **Chyba! Nenalezen zdroj odkazů.** shows an apparent low volume of CO_2 and H_2 and an elevated volume of hydrocarbons produced by gasification of the mix of SSMW and wood chips. A detailed composition of simple hydrocarbons is shown in Fig. 4. The elevated content of hydrocarbons results in a higher HHV (higher heating value) of the syngas produced from the SSMW and the mix of SSMW and wood chips that is apparent from Tab. 2. Considering almost the same results from the SSMW and the mix of SSMW and wood chips, one can assume that the lower temperature has a significant effect on the gasification leading to a dominant

influence of methanizing reactions (see Fig. 4). The syngases produced from the other fuels (the crushed chipboard and the spruce wood chips) have similar compositions and HHVs which can also be seen in Tab. 2.

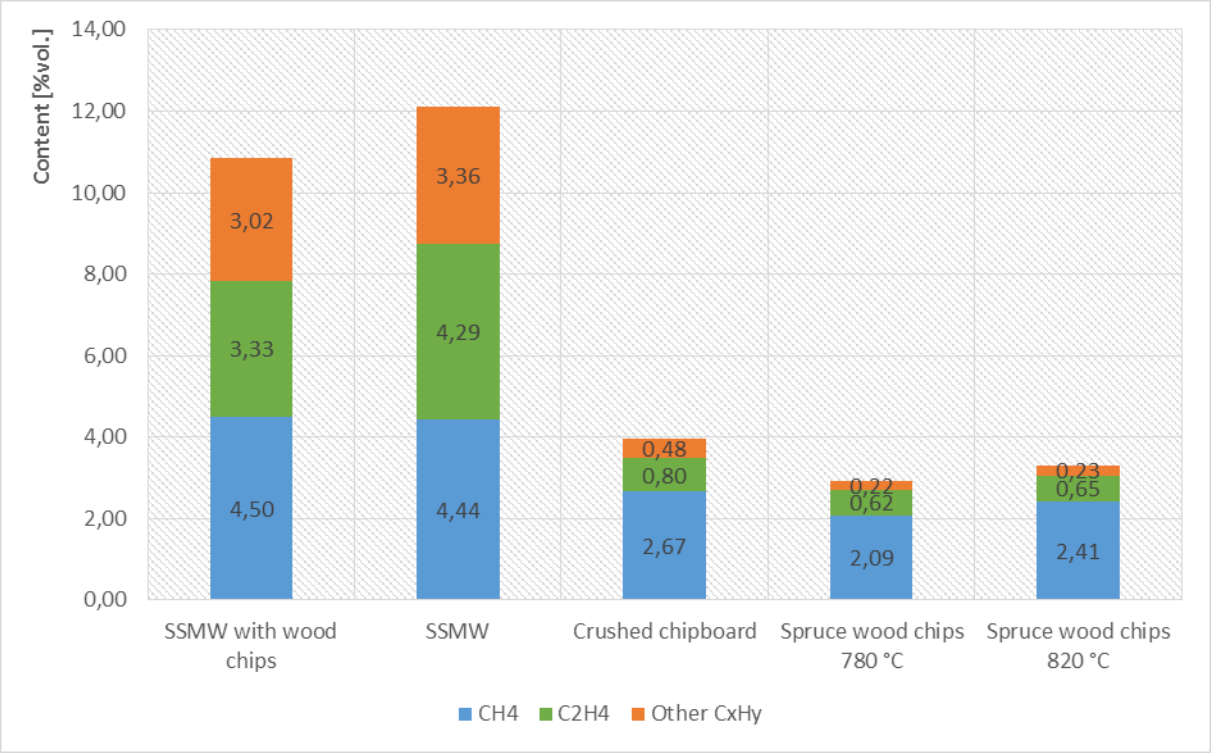

Fig. 4 Detailed composition of lower hydrocarbons contained in the produced syngas

Tab. 2 Higher heating value of the produced syngas

	HHV of the syngas [MJ/m$_n^3$]
SSMW	9,93
SSMW + wood chips	9,52
Crushed chipboard	4,73
Spruce wood chips (780 °C)	4,13
Spruce wood chips (820 °C)	4,73

Distinctive differences can be observed in the amount and the composition of the produced tars shown in Fig. 5. Here are listed the total amount of the tars in the produced syngas and their basic classification in the tar grades according to the ECN based on their ability to condense and dissolve in water [9]. The class 2 includes notably heterocyclic compounds (polar oxygenates and polar nitrogen compound, e. g. pyridine, phenol, cresol, quinoline …), the class 4 includes simple polycyclic aromatic hydrocarbons (2 – 3 cyclic PAHs like naphthalene, biphenyl, fluorene, anthracene, phenanthrene …) and the class 5 includes heavy polycyclic aromatic hydrocarbons with 4 or more cycles (fluoranthene, pyrene, benzoantracen, perylene, indenopyrene).

While interpretation of these results one must still have in mind that these are results for a fuel that will be further thermally treated (combusted) and prior to that it can be even cleaned. Only the

composition of a flue gas from combustion of such fuel can be compared with composition of flue gasses from the standard municipal waste incinerators.

The tar from the gasification of the crushed chipboard contains a large amount of phenols and oxygenates which is a result of the fuel composition. The tars originating from the fuels containing a sorted municipal waste are mainly the class 4, simple polycyclic aromatic hydrocarbons. These results are mostly in agreement with theoretical expectations for tars produced from fuel of given composition and for the operating temperatures that are most suitable for production of so called "secondary tars". At these temperatures also starts production of "tertiary tars" [10]. From the Fig. 5 is also obvious that the amount of tars in the syngas from gasification of SSMW (11 – 13 g/m_n^3), including the crushed chipboard (5 g/m_n^3), is much higher than the one from the spruce wood chips (pure biomass). That might present a problem with some technologies like internal combustion engines for which are the limits of tars in exhaust gases around 50 – 100 mg/m_n^3. That can currently be an obstacle for a wider use of the technology in commercial sphere. The cleaning technologies are only in development and the technological and energy requirements for cleaning processes for a tar elimination have a negative impact on economy and profitability of the operation. Therefore, it is important to seek options of direct use of the syngas, for example in lime factories, cement factories or as a replacement for fossil fuels in steam generators.

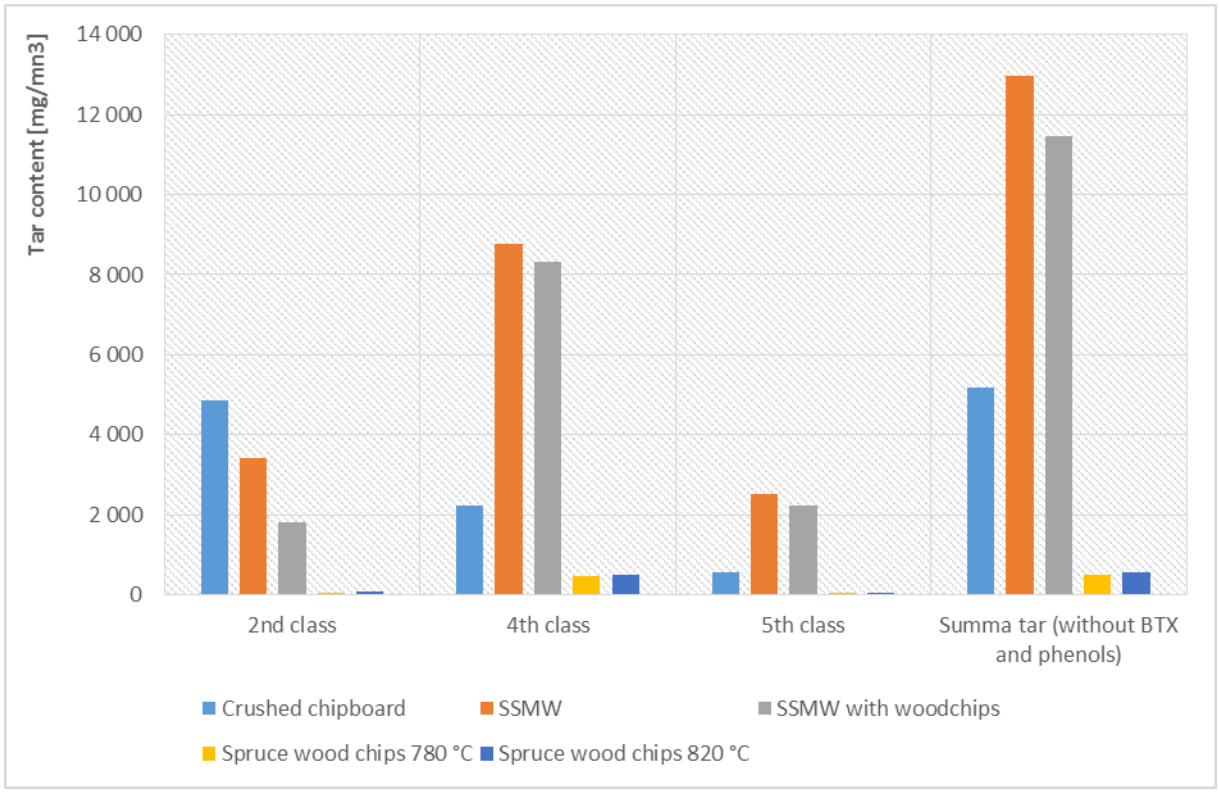

Fig. 5 Amount of tars in the produced Syngas and their basic classification

Conclusion

The main goal of this paper was to present basic knowledge gained from gasification of selected fuels in a fluidized bed generator and show main advantages of utilization of such technology for thermic processing of waste. The results show that the tested materials are suitable for gasification in a fluidized bed reactor, however it is important to carefully ponder the subsequent use of the produced syngas. The high amount of tars created in the process of gasification might be a great obstacle for utilization of the

syngas in internal combustion engines or gas turbines. This is the main reason of failure of many projects for gasification of biomass or waste.

In the next phase it will be convenient, despite considerable financial demands of such analysis, to address in greater detail amounts of other pollutants, notably dioxins, furans and other chlorine compounds. Also, it will be important to make a detailed analysis of a transfer of heavy metals into the syngas. However, it will be useful to observe these pollutants not in the produced syngas, but in the final product which is the flue gas from the energy technology that has applied the syngas. These results than can be compared with the legislation in effect or with the emission levels of classical waste incinerators plants.

Acknowledgement:

This work is an output of research and scientific activities of NETME CENTRE PLUS (LO1202) by financial means from the Ministry of Education, Youth and Sports under the „National Sustainability Programme I“.

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Fluidní zplyňování vybraných odpadů

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Abstrakt

Příspěvek se v úvodní části zabývá teoretickým popisem výhod využití technologie fluidního zplyňování odpadů oproti klasickému spalování. Stěžejní část příspěvku je pak věnována výsledkům experimentů zplyňování vybraných odpadů ve fluidním generátoru s cirkulujícím fluidním ložem a jejich porovnání. Sledovanými parametry byla zejména výhřevnost a složení produkovaného plynu a obsah dehtu v plynu. Experimenty byly prováděny na poloprovozním zařízení Biofluid na VUT v Brně.

***Klíčová slova**: odpady, zplyňování, dehty, syngas, spalné teplo*

The EU Environmental Technology Verification (ETV) pilot programme

Evžen ONDRÁČEK
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Summary

The EU Environmental Technology Verification (ETV) pilot programme is an internationally recognized scheme to support commercialization of innovative, environmental technologies.

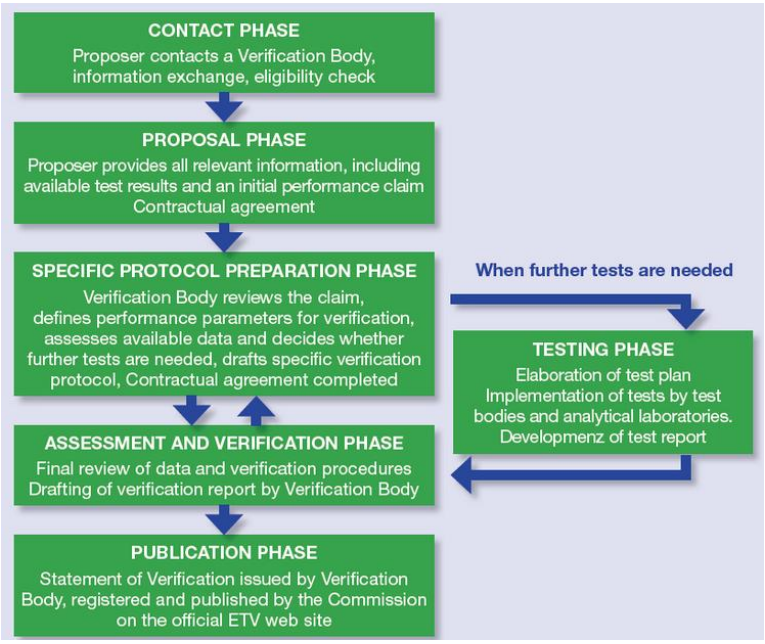
The Czech Environmental Management Center operates as a Verification Body (VB) for two areas „Material, Waste and Resources" and Water treatment and monitoring" under the new EU Environmental Technology Verification (ETV) pilot programme.

Keywords: *verification, innovative, environmental, technology, Material, waste, resources, water*

Background

The EU Environmental Technology Verification (ETV) pilot programme is an internationally recognized scheme to support commercialization of innovative, environmental technologies.

- ETV is a voluntary scheme that provides the verification, by qualified third party organizations (VBs), of the performance claims of new environmental technologies.
- This should help manufacturers prove the reliability of their claims, and help technology purchasers identify innovations that suit their needs.
- ETV is not about defining minimum requirements, but about ensuring the credibility of performance claims put forward by a manufacturer, thus going beyond existing minimum requirements.
- ETV is not a new idea, and has been successfully implemented in the United States, China, Japan, Korea, Canada and the Philippines, and ongoing dialogue exists between the EU and these states on the implementation of ETV.



Key processes in ETV

Proposers – what's in it for you?

- At present, standards and regulations take a long time to catch up to cutting edge technology. If you have a new technology that is not covered by current standards, how can you prove to investors or customers that the performance claims of your product are correct?
- The 'Statement of Verification' reflects the actual performance of the specific technology. There is no pass/fail outcome like other product certification schemes.
- Innovative SMEs can gain competitive advantage by differentiating their technology from that of larger competitors.
- An International Working Group on ETV is preparing the ground for the mutual recognition of ETV programmes. This will enable new innovative technologies to be recognized internationally with the ETV statement of verification.

Contact

For more information, please visit http://www.tretiruka.cz/eu-etv/, http://iet.jrc.ec.europa.eu/etv/ or contact us at ondracek@cemc.cz

Pilotní program ověřování environmentálních technologií EU ETV

Evžen ONDRÁČEK

CEMC - České ekologické manažerské centrum, 28. pluku 25, 101 00 Praha 10, ondracek@cemc.cz

Souhrn

EU ETV je mezinárodní pilotní program na podporu komercionalizace inovativních environmentálních technologií a dalších technologií přínosných pro životní prostředí.

Při CEMC v rámci tohoto pilotního programu vznikl jako jediný v ČR a SR akreditační orgán CEMC ETVCZ pro technologické oblasti Materiály, odpady a zdroje a Čištění a monitorování vody.

Klíčová slova: *akreditace, inovace, materiály, odpady, zdroje, voda*

Týden výzkumu a inovací pro praxi 2016

Ondřej Procházka
České ekologické manažerské centrum, 28. pluku 25, 101 00 Praha 10
e-mail: prochazka@cemc.cz, www.tvip.cz

Týden výzkumu a inovací pro praxi 2016 (TVIP 2016) je unikátní setkání výzkumných pracovníků z oblasti aplikovaného výzkumu se zástupci firem, které by potenciálně mohli mít o jejich výsledky zájem.

TVIP je určen:

- k prezentaci výsledků výzkumu formou srozumitelnou široké odborné veřejnosti,
- pro zástupce podnikatelské sféry a veřejné správy, aby se seznámili s výzkumnými tématy a projekty, na kterých se v ČR a SR,
- k seznámení představitelů výzkumné obce s potřebami reálné průmyslové a komunální praxe a případnému navázání spolupráce.

Příští ročník se uskuteční 15. až 18. 3. 2016 opět v Hustopečích u Brna a v jeho rámci se koná i 11. ročník symposia **ODPADOVÉ FÓRUM 2016**.

Připravovaný ročník TVIP přinese několik novinek a z nich je jedna zásadní. **Oblast zájmu** dosud soustředěná především na odpady **se nově rozšiřuje dále na oblasti výzkumu a vývoje** pro vodní hospodářství, odpadní plyny a čištění spalin a také na otázky související s výrobou a hospodařením s energiemi. Zkrátka **pro celou oblast průmyslové a komunální ekologie**.

Sekce **Odpady** bude těžit z tradice zavedeného symposia ODPADOVÉ FÓRUM se neliší od témat sympozia Odpadové fórum, na kterou přímo navazuje.

V rámci sekce **Voda** považujeme za nejvýznamnější témata Čištění průmyslových odpadních vod, Recyklace vody a Získávaní cenných látek z odpadních vod.

Do sekce **Ovzduší** patří především Čištění odpadních plynů a spalin, Snižování a monitorování emisí, Zdravotní aspekty znečištění ovzduší.

Sekce **Energie** má být věnována jak problémům spojeným s obnovitelnými zdroji energie, tak s klasickou energetikou. Samostatným tématem v rámci této sekce je skladování energie a využití dočasných přebytků energie a chytré sítě.

Druhou významnou novinkou je to, že paralelně s TVIP 2016 se bude na stejném místě konat konference **Průmyslová ekologie 2016**, kterou dříve pořádala VSCHT v Praze a teď ji bude odborně zaštiťovat v čele s děkanem Fakulty ochrany životního prostředí doc. Ing. Vladimír Kočí, Ph.D. Tato konference je pro změnu určena pro podnikové ekology a další provozní pracovníky. Účastníci této konference budou mít volný přístup na konferenci TVIP, čímž by se mohl zvýšit zájem ze strany podniků o výsledky výzkumu.

Příspěvky z TVIP, které doporučí redakční rada a jejich autoři o to projeví zájem, budou moci být uveřejněny ve WASTE FORUM bez nutnosti platit publikační poplatek.

Na závěr shrnujeme:

Týden výzkumu a inovací 2016 se bude konat v termínu 15. – 18. 3. 2016 v Hustopečích.

Důležité termíny:
přihlášky příspěvků 4. 1. 2016,
plné texty do sborníku 15. 2. 2016
přihlášky účasti 15. 2. 2016

Veškeré informace najdete na www.tvip.cz. Zde budeme rovněž informovat o výsledku jednání okolo konference Průmyslová ekologie 2016.

Dotazy na prochazka@cemc.cz.