

## ASSESSMENT OF CURRENT QUALITY OF BIODEGRADABLE MUNICIPAL WASTE SEPARATED BY RESIDENTS OF KROMĚŘÍŽ

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### Abstract

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In an effort to meet the requirements for maximum material utilization, which is set forth in the Act No. 185/2001 Coll. on Waste and amendments to other Acts, and to achieve the objectives of the Waste Management Plan of the Czech Republic to reduce biodegradable waste going to landfill, a proposal for widespread deployment of separate collection and processing of biodegradable municipal waste in municipalities has become part of the amendment Act prepared by the ministry. In many places of the country pilot projects have been launched to test the technology and logistics of sorting, collecting, processing and utilizing biodegradable municipal waste separated by residents.

Separate collection of biodegradable municipal waste in Kroměříž was launched as a pilot project in 1992. Despite all the residents' education, the management of Biopas is not satisfied with the quality of biodegradable waste separation; problems occur especially in the residential area. Biodegradable waste separated by residents, due to its unacceptable amount of impurities, is transported to the landfill Kuchyňky near the village Zdounky 10 km distant but detailed data on the amount of impurities in separate biodegradable municipal waste were missing.

Therefore an analysis of separate biodegradable municipal waste has been carried out. Individual samples were collected within two days of separate waste delivery, without any modifications (scattering, compaction). The sample size was at least 200 kg, the sample was manually sorted according to the Catalogue of Waste into biodegradable waste (200201), other non-biodegradable waste (200203) and biodegradable waste unsuitable for composting (e.g. animal by-products). It was found that the amount of unacceptable impurities in separate biodegradable waste considerably varies from 1 to 9 %<sub>wet</sub>.

It can be concluded that the amount of unacceptable impurities in biowaste is too large to allow composting and compost production (in 2009).

biodegradable waste, purity of separate waste, waste separation by residents, undesirable impurities

In an effort to meet the requirements for maximum material utilization, which is set forth in the Act No. 185/2001 on Waste and amendments to other Acts, and to achieve the objectives of the Waste Management Plan of the Czech Republic to reduce biodegradable waste going to landfill, a proposal for widespread deployment of separate collection and processing of biodegradable municipal waste in municipalities has become part of the Waste Bill prepared by the ministry. In many places of the country pilot projects have been launched to test the tech-

nology and logistics of sorting, collecting, processing and utilizing biodegradable municipal waste separated by residents.

Separate collection of biodegradable municipal waste in Kroměříž was launched as a pilot project in 1992. The project work was carried out by Biopas Company, which offers municipal waste management services for the city of Kroměříž. The initiator of the project was an Austrian company Saubermacher [Miarková, 2006]. Biodegradable waste has still been collected at selected places in residential areas.

Despite all the residents' education, the management of Biopas is not satisfied with the quality of biodegradable waste separation; problems occur especially in the residential area. Therefore, urban green waste is transported to the composting plant at Morkovice 15 km distant, whereas the biodegradable waste separated by residents, due to its unacceptable amount of impurities, is transported to the landfill Kuchyňky near the village Zdounky 10 km distant. Detailed data on the amount of impurities in separate biodegradable municipal waste are still missing.

The aim of the analysis of separate biodegradable municipal waste was to assess the current state of quality of biodegradable waste separation in Kroměříž to determine the ratio of biodegradable to non-biodegradable materials and on the basis of the analysis to recommend the best method for waste utilization.

Detailed data about unacceptable impurities in separate municipal waste, especially with regard to separate biodegradable waste, have not been published yet (according to the databases ISI, Scopus and ScienceDirect), and therefore, comparison of the results obtained with the conclusions from abroad is impossible. Relevant data were published in the Czech Republic by Mgr. Chudárek of SITA CZ Company and by Ing. Pavel Novák along with experts from the Czech Agricultural University and the Czech Association for Biomass in the research project SP/II/2f1/21/07 "Research into the properties of the products of biological treatment of municipal biowaste collected separately from households in housing estates, housing and built-up area of family houses".

## MATERIALS AND METHODS

For operational reasons, separate waste was analyzed after its collection in the experimental bioreactor on the premises of the landfill Kuchyňky of Depoz spol. s r. o. Company.

Measurements were made from the beginning of waste transportation to the experimental bioreactor, i.e. from 28 April 2009 to 4 August 2009; a total

of 10 samples were taken. Individual samples were collected within two days of separate waste delivery, without any modifications (scattering, compaction). The sample size was at least 200 kg, the sample was manually sorted according to the Catalogue of Waste into biodegradable waste (200201), other non-biodegradable waste (200203) and biodegradable waste unsuitable for composting (e.g. animal by-products). Individual fractions were placed in containers with a capacity of 16 dm<sup>3</sup> and then weighed on the mechanical scales (spring scale) to the nearest 0.5 kg.

The recorded values were used to determine unacceptable impurities by weight and volume in the sorted biodegradable municipal waste.

## RESULTS AND DISCUSSION

In the study the proportion of unacceptable impurities in biodegradable municipal waste sorted at selected locations in Kroměříž was determined. The values of the weight and volume were converted to a percentage weight and volume representation of specific fractions. Unacceptable impurities were either small objects or bags of mixed household waste. The measured values of particular measurements and converting them to mass respectively volume percentage are listed in Tab. I and Tab. II.

As evident from the measurement values, the amount of unacceptable impurities in separate biodegradable waste considerably varies from 1 to 9%<sub>wt</sub> (1–11.5%<sub>vol</sub>).

Anyway, it can be concluded that the amount of unacceptable impurities in biowaste is too large to allow composting and compost production. The acceptable level of impurities for composting depends on the technological equipment of the composting facility and is usually 1 – 2% of impurities [Plíva, 2007; Roy, 2007]. The purity of the sample was detected only once. The average proportion of impurities in separate biowaste is significantly higher (compared with the situation in Tišnov, where the proportion of impurities is about 2%). [Chudárek, 2008]

It is difficult to process separate biodegradable waste from the Kromeriz site into usable product in

I: Measured and calculated values of the weight of impurities in separate biodegradable municipal waste from Kroměříž

Delivery date	Sample weight [kg]	Biowaste weight [kg]	Impurities weight [kg]	Biowaste weight [% <sub>wt</sub> ]	Impurities weight [% <sub>vol</sub> ]
28. 4. 2009	206	190.5	15.5	92.5	7.5
12. 5. 2009	205	191	14	93.2	6.8
26. 5. 2009	212	196	16	92.5	7.5
9. 6. 2009	201	183	18	91.0	9.0
23. 6. 2009	211	204	7	96.7	3.3
7. 7. 2009	208	200	8	96.2	3.8
15. 7. 2009	212	204	8	96.2	3.8
21. 7. 2009	213.5	206.5	7	96.7	3.3
29. 7. 2009	205	203	2	99.0	1.0
4. 8. 2009	224.5	206	18.5	91.8	8.2

II: Measured and calculated values of the volume of impurities in separate biodegradable municipal waste from Kroměříž

Delivery date	Sample volume [dm <sup>3</sup> ]	Biowaste volume [dm <sup>3</sup> ]	Impurities volume [dm <sup>3</sup> ]	Biowaste volume [% <sub>vol.</sub> ]	Impurities volume [% <sub>vol.</sub> ]
28. 4. 2009	524	480	44	91.6	8.4
12. 5. 2009	480	448	32	93.3	6.7
26. 5. 2009	432	400	32	92.6	7.4
9. 6. 2009	416	368	48	88.5	11.5
23. 6. 2009	368	352	16	95.7	4.3
7. 7. 2009	400	384	16	96.0	4.0
15. 7. 2009	336	320	16	95.2	4.8
21. 7. 2009	464	448	16	96.6	3.4
29. 7. 2009	404	400	4	99.0	1.0
4. 8. 2009	456	416	40	91.2	8.8

the current situation. After simple biological stabilization, the output can be put in the 3rd group of outputs from biological waste utilization facilities by Amendment No. 6 to Decree No. 341/2008 Coll., i.e. stabilized biological waste intended for landfilling. Any other waste treatment (e.g. sifting to separate unacceptable impurities from stabilized biowaste) aimed at achieving quality of 2nd group of

Class III would be too expensive. No treatment of biowaste and/or output substrate that would allow their use on the market is expected.

If the effort to make people separate biodegradable waste more effectively fails, the management of Biopas Company will be considering using waste for energy production.

## SUMMARY

In an effort to meet the requirements for maximum material utilization, which is set forth in the Act No. 185/2001 Coll. on Waste and amendments to other Acts, and to achieve the objectives of the Waste Management Plan of the Czech Republic to reduce biodegradable waste going to landfill, a proposal for widespread deployment of separate collection and processing of biodegradable municipal waste in municipalities has become part of the amendment Act prepared by the ministry. In many places of the country pilot projects have been launched to test the technology and logistics of sorting, collecting, processing and utilizing biodegradable municipal waste separated by residents.

Separate collection of biodegradable municipal waste in Kroměříž was launched as a pilot project in 1992. Despite all the residents' education, the management of Biopas is not satisfied with the quality of biodegradable waste separation; problems occur especially in the residential area but detailed data on the amount of impurities in separate biodegradable municipal waste were missing. Therefore an analysis of separate biodegradable municipal waste has been carried out.

Individual samples were collected within two days of separate waste delivery, without any modifications (scattering, compaction). The sample size was at least 200 kg, the sample was manually sorted according to the Catalogue of Waste into biodegradable waste (200201), other non-biodegradable waste (200203) and biodegradable waste unsuitable for composting (e.g. animal by-products). Individual fractions were placed in containers with a capacity of 16 dm<sup>3</sup> and then weighed on the mechanical scales (spring scale) to the nearest 0.5 kg.

The values of the weight and volume were converted to a percentage weight and volume representation of specific fractions. Unacceptable impurities were either small objects or bags of mixed household waste.

Measured values showed that the rate of non-biodegradable impurities is from 1% to 9% of weight (from 1% to 11.5% of volume). It is too high proportion to composting of this sorted waste.

## SOUHRN

Zhodnocení aktuální kvality biologicky rozložitelného komunálního odpadu tříděného občany města Kroměříž

Ve snaze vyhovět požadavku o maximální materiálové využití odpadů, jež je dané zákonem č. 185/2001 Sb., o odpadech a o změně některých dalších zákonů, ve znění pozdějších předpisů, a dále pro dosažení cíle Plánu odpadového hospodářství České republiky na snížení biologicky roz-

ložitelných odpadů ukládaných na skládku, je součástí ministerstvem životního prostředí připraveného návrhu nového zákona o odpadech i návrh na plošné zavedení povinnosti odděleného sběru a zpracování biologicky rozložitelných komunálních odpadů (BRKO) v obcích. Na mnoha místech republiky tak byly spuštěny pilotní projekty pro ověření a ozkoušení technologie a logistiky třídění, sběru, svozu, zpracování a využití vytríděného BRKO od občanů.

Separovaný sběr komunálního biologicky rozložitelného odpadu v Kroměříži byl zahájen v rámci pilotního projektu v roce 1992. Přes veškerou osvětu není vedení společnosti Biopas s kvalitou třídění biologicky rozložitelných odpadů spokojeno; problémy nastávají zejména v lokalitě zástavby bytových domů, ale konkrétní data o míře znečištění tříděného BRKO dosud chyběla. Proto byl proveden rozbor tříděného biologicky rozložitelného komunálního odpadu.

Jednotlivé vzorky byly odebrány nejpozději do dvou dnů po návozu vytríděných odpadů, bez jakékoli úpravy (rozhrnutí, zhutnění). Velikost vzorku byla minimálně 200 kg, vzorek byl manuálně roztržěn dle Katalogu odpadů na Biologicky rozložitelný odpad (200201) a na Jiný biologicky nerozložitelný odpad (200203), případně biologicky rozložitelný odpad nevhodný ke kompostování (např. vedlejší produkty živočišné výroby). Jednotlivé frakce byly vloženy do nádob o objemu 16 dm<sup>3</sup> a v nich zváženy na závěsné mechanické váze (mincíř) s přesností 0,5 kg.

Naměřené hmotnostní a objemové hodnoty byly z důvodů eliminace mírně rozdílných velikostí vzorků přepočítány na procentuální hmotnostní a objemové zastoupení jednotlivých složek. Nežádoucí příměsi byly zčásti tvořeny drobnými předměty, zčásti celými taškami se směsným komunálním odpadem.

Naměřené hodnoty ukazují, že míra biologicky nerozložitelných příměsí se pohybuje od 1 % do 9 % hm. (od 1 % do 11,5 % obj.). Tato míra znečištění neumožňuje kompostování daného vytríděného odpadu.

biologicky rozložitelný odpad, čistota tříděného odpadu, třídění odpadu občany, nežádoucí příměsi

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- Nařízení vlády č. 197/2003 Sb., o Plánu odpadového hospodářství České republiky.
- Vyhláška č. 341/2008 Sb. o podrobnostech nakládání s biologicky rozložitelnými odpady.
- Vyhláška č. 381/2001 Sb. v úplném znění, kterou se stanoví Katalog odpadů, Seznam nebezpečných odpadů a seznamy odpadů a států pro účely vývozu, dovozu a tranzitu odpadů a postup při udělování souhlasu k vývozu, dovozu a tranzitu odpadů (Katalog odpadů).

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