HANDLING WITH COMMUNAL SOLID WASTE

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Summary: Examination of communal waste logistics is still discipline with small attention and focusion in CR. Contemporary speed growth of waste creation not only within CR but also in EU requires new methods both for processing of this waste and also new methods of monitoring of waste origin and their salvage of course. This article is published within solution of MDCR project „Modelling of city waste logistics“.

Key words: communal waste, communal waste logistics

1. INTRODUCTION

Communal waste from settlements can be characterized as waste arised in households and other urban or settlement operations (waste from greenery and recreation, from civil equipment, local service industry, transport, technical equipment). 70 percent of its occurrence is organizationally and regularly brought together to next usage or disposal [3]. Volume and content of communal waste are variable quantities and they are connected with e.g. momentary economical situation.

2. ACCUMULATION AND SALVAGE OF COMMUNAL SOLID WASTE

Households and organisations put waste to collecting containers on pre-fixed places to be easily accessible by their filling and following emptying and disposal. Collecting containers are used to temporary waste accumulation and their emptying is periodically assured by particular firm by means of special lorry for rubbish collection equipped by special superstructure with tilter.

Tab. 1 – Accumulation of waste according to type of collecting vessels

Kind of waste	Collecting vessels										
	Upper discharge chute			Bottom discharge chute				Bulk containers			PE sacks
	1100 l	240 l	110 / 120 l	1,5 m^3	1,1 m^3	1,3 m^3	2,1 / 2,5 m^3	up to 5 m^3	5-10 m^3	10-30 m^3	
20 01 01 Paper	X	X	X	X	X	X	X		X	X	X
20 01 02 Glass	X	X	X	X	X	X	X		X		X
20 01 08 Biologically decomposable garbage from kitchens and canteens		X	X								
20 01 10 Clothes								X			X
20 01 11 Textil materials								X			X
20 01 25 Edible oil and fat		X	X								

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20 01 28 Paints, inks, adhesives and synthetic resins uninitiated under 20 01 27		X	X								
20 01 34 Batteries and acumulators uninitiated under 20 01 33		X	X								
20 01 36 Discarded electric and electronic devices uninitiated under 20 01 21/23/35								X	X	X	
20 01 39 Plastics	X	X	X	X	X	X	X		X	X	X
20 01 40 Metals		X	X						X	X	
20 02 01 Biologically decomposable waste		X	X						X	X	
20 02 02 Soil and stones									X		
20 03 01 Mixed communal waste	X	X	X								
20 03 02 Waste from marketplaces		X	X					X	X		
20 03 03 Street garbage								X			
20 03 07 Bulk waste									X	X	

Source: Novák, 2009

According to concrete conditions of collecting area, type and size of used containers is determined. In case of their unsufficient amount and capacity, waste is freely placed out of them. Removal costs then markedly exceed costs related to operation of optimal number of collecting containers.

Requirements for collecting containers [1, 4]:

- low weight,
- easy and light manipulability also with content (containers supplemented by wheels, appropriate supplements, hitches),
- low noisiness by manipulation,
- universal usage,
- endurance to chemical a physical wear (resistant material, surface working, colour constancy of plastic containers),
- minimal maintenance,
- long lifetime period ,
- low price,
- possibility of recycling.

These requirements are not possible to keep always in the highest possible degree and that is why it is necessary to select appropriate compromise solution for certain situation.

3. COLLECTION AND TRANSPORTATION OF COMMUNAL SOLID WASTE

The whole process of handling with communal solid waste consists of two parts. Firstly citizens transfer waste to place for waste accumulation on their own costs, in this case we speak about container nests, stations of waste dustbins, places for container addition etc. Considering the fact, that this transportation is realized directly by citizens on their own direct costs, delivery distance is necessary to be the shortest and transfer of waste not to be difficult.

Then waste is transfered from place of accumulation to place of disposal (dump, sort line, incinerator etc.). Collection and transportation of waste is realized by collecting firm on basis of contract concluded with municipality.

Transportations of communal solid waste can be divided by:

- used transport mean,
- hauling distance.

3.1 Transport Means

The most widespread mean of transport for communal solid waste is lorry. They are specially constructed from this reason and that is why they are of very miscellaneous types.

According to their use purpose, they can be divided into three groups [1, 4]:

1) Collecting cars are determined for disposition of mixed communal garbage accumulated in normalised waste vessels. Car construction is based on partially modified undercarriage of lorry and special superstructures.
   Producers offer on market the whole range of superstructions with capacities 6 – 25 m^3 and with effective load up to 18 tons. Usage of given type of car then depends on transport conditions, kind and surface accumulation of waste in concrete collecting area and type of housebuilding, where is necessary to assure collection also from difficultly accessible places as narrow streets in old housebuilding etc.
2) Container carriers are used for disposition of garbage accumulated in containers determined for collection of waste. Their construction differs according to way of loading on car. We can identify hooked loader and arm loaders.
   Hooked loaders transport generating containers, that are distinguished by eye on attachment of peg on front side and rolls located on bottom part below back side. Container can be emptied by tilt back.
   Arm loader consists of two arms, which move simultaneously. Each arm has two chains with pegs for container fastening by fixtures on both sides. Tub containers are used („mulds“). Some loaders can load and manipulate with containers for longer distance by hydraulic expansion of arms or reload them on container trailer.
   Hydraulic hand-arm can be installed on container carrier. Hand is equipped by two-lever hanger, by this manipulation and emptying of vessels for separated waste is made to container located on car.
3) Lorries set for long-distance transportation of waste are used for transfer from intermediate storage to place of garbage disposal, in case to other intermediate storage. Vehicle combination for this are used, they haul bulk containers. These combinations consist of road tractor (container carrier) and trailer. Tractor is able to handle with containers itself. Enclosed containers or containers with open top about capacity up to 30 m^3 . Considering to utilization of car effective load and capacity reduction of transported waste, it is appropriate to use compacting pressing containers.

3.2 Hauling Distance

Transportation comprises both transfer of waste from place of its origin to place of its accumulation and transfer of waste from place of accumulation to disposal place [2].

If we consider hauling distance (distance between place of waste origin and its disposal place), transition of waste could be organized as one-period, two-period, in case more-period [2].

One-period transportation

It is transport from place of origin or accumulation to place of its disposal without any reload by one car. This way is suitable for shorter hauling distances, it is the most used in CR.

Two- and more-period transportations

It is based on assurance of successive collection of waste by collecting cars to intermediate storages, where it is shortly stored for accumulation, in case sorting out. After accumulation of sufficient mass, waste is loaded to bulk containers and next is transported to place of disposal. By two- or more-period transport, decisive factor for formation of intermediate storages is year occurrence of waste in particular collecting area and its location in centre of occurence of waste. Such transportations are suitable to higher usage with growing hauling distance from economical viewpoint

3.3 MSTS System

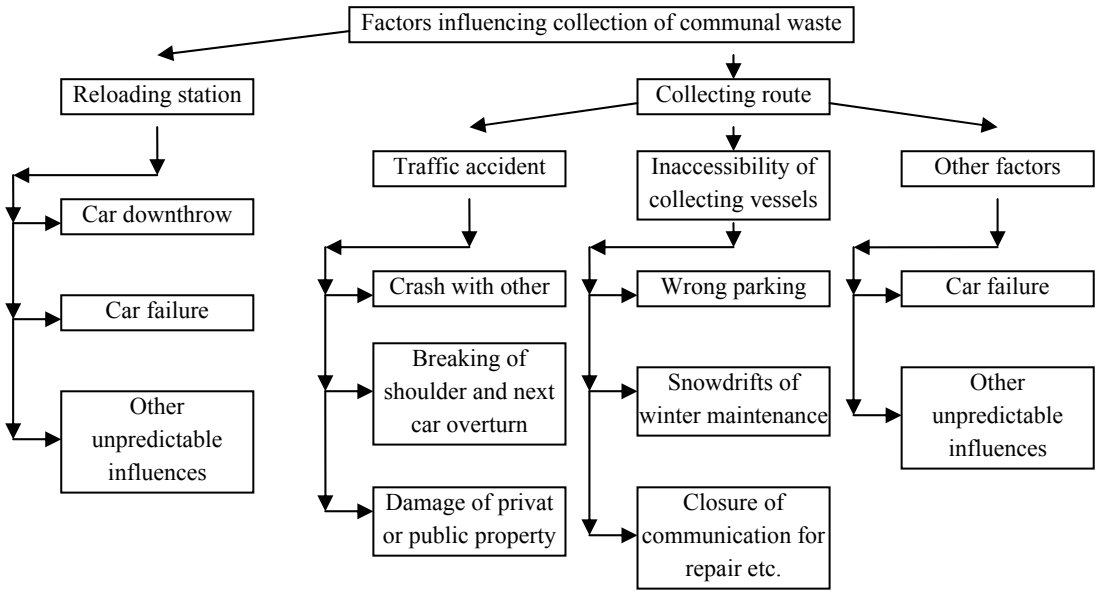
Highly modern and effective ways of accumulation and collection of waste are realized in operation abroad. In domestic CR conditions, we can speak about so called MSTS system.

This system utilize collecting cars, container carriers and lorries for long-distance transportation of waste and it is always minimally two-period transportation.

Collecting cars transport waste from collecting vessels to intermediate storage, where waste is put to bulk containers about capacity 20 m^3 . Vehicle combinations then can transport simultaneously three these containers to final disposal.

The main advantages of this system are [1, 4]:

- collection and transportation of waste to disposal are separated,
- it is fully usable for various kinds of waste,
- it markedly makes easier existing nonhygienic anf physically tiring labour,
- productivity of labour essencially increases and utilization of collecting cars as well.



Source: Sojka, 2009

Fig. 1 – Factors influencing collection of communal waste

4. CONCLUSION

Waste economy can be considered as new technological branch, which directly relates to all degrees of product and consumer cycle from raw material extraction over production, transport and consumption of these products up to their disposal, when after expiration of service life they become so called consumer waste. Waste economy thus has influence on all components of national economy.

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REFERENCES

[1] FILIP, J. a kol. Komunální odpad a skládkování. Brno: Edit centre MZL, 2003. ISBN 80-7157-712-X.

[2] HLAVATÁ, M. Odpadové hospodářství.. Ostrava: VŠB - TU, 2006. ISBN 80-248-0737-8.

[3] Informace pro veřejnost [online]. EKO - KOM, 2009. [cit. 2009-04-26]. Available on WWW: <http://www.ekokom.cz/scripts/detail.php?id=146>.

[4] KIZLINK, J. Nakládání s odpady. Brno: Faculty of Chemics VUT, 2007. ISBN 978-80-214-3348-9.

[5] NOVÁK, P. Modelování logistiky odpadů v městských aglomeracích, Study: Jan Perner Transport Faculty, MD ČR CG932-066-520, 2009.

[6] SOJKA, L. Optimalizace nákladů spojených se svozem komunálního odpadu. Thesis: University of Pardubice, Jan Perner Transport Faculty, 2009.

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