

Waste Disposal Vehicle and Method for the Operation of a Waste Disposal Vehicle

The invention refers to a method for the operation of a waste disposal vehicle, which at least includes a computer-subsystem recording and processing vehicle data and activity data, in particular through sensors. The invention refers also to a waste disposal vehicle with at least one computer-subsystem recording vehicle data and/or activity data, in particular through sensors.

In the waste management industry, particularly in waste disposal, it is known as state-of-the-art technology, to deploy waste disposal vehicles, e.g. refuse collection vehicles, for the emptying of waste containers, in order to collect and dispose household waste in cities and communities.

In doing so, several computer-subsystems are typically used in a waste disposal vehicle, functioning separately from each other and controlling various applications within a waste disposal vehicle. For example, it concerns a computer-subsystem for the control of filling, intended for taking the waste container from the street and for dumping, to initiate the emptying of waste vehicles.

Likewise, computer-subsystem may be intended for the control of the vehicle or the recording of vehicle data, furthermore for the vehicle's body or other applications as well. At each of the aforementioned applications, it might be intended to



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undertake the control and to record and save application data.

For business management considerations, the disposers operating such waste disposal vehicles strive more and more to implement optimisation, e.g. with the tours being serviced by the waste disposal vehicles. Moreover, the disposers strive to monitor and ensure the vehicles' functionality and to manage maintenance and service assignments best possible, in particular not too early to avoid extra costs for too much maintenance, but also not too late, to avoid extra costs by vehicles' failures. All in all, it is the aim to use the capacity and operate the vehicles to the optimum.

For this reason, it is state-of-the-art and intended to store the data provided by the individual computer-subsystems. Because the individual computer-subsystems typically originate from various suppliers, the storing of the data provided by a computer-subsystem happens separately for each computer-subsystem, and after the storing, e.g. with data medium, it is possible to retrieve and process each of the stored data.

However, this is unfavorable because it is directly not possible to interconnect the individual data of the various computer-subsystems, e.g. to correlate them. Hence, there is no possibility to analyse the individual available data optimally. Due to different data systems and standards it is occasionally not possible to interconnect the data at all.

The purpose of the invention is to provide a method and a waste disposal vehicle, with which the aforementioned handicaps are overcome,

thus with which an optimum monitoring of all data accruing in a waste disposal vehicle would be possible. According to invention, it shall be possible to obtain a total overview of the accruing data, to interconnect the data and to analyse them in an overall view, and to achieve an optimisation of the vehicles' tours by using business management considerations.

According to invention, the problem is solved by collecting the data of at least a part of the computer-subsystems, especially preferred the data of each computer-subsystem, by an in-vehicle collection system, and by transmitting via communication to an ex-vehicle collection unit. For the realisation of this method it may be provided in a waste disposal vehicle according to invention, that the waste disposal vehicle encompasses a collection system with data of at least a part of the computer-subsystems, especially the data of each computer-subsystem are collectable and transmittable by communication to an ex-vehicle collection unit.

The central idea of the invention lies therein that henceforth with the method and the waste disposal vehicle according to invention respectively there will be also an in-vehicle collection system besides the individual computer-subsystems, whereby this may be realised - if applicable - by one of the computer-subsystems, with which the data of the computer-subsystems are recorded and stored.

According to invention it is intended, that these collected data are transmitted from the in-vehicle collection system to an ex-vehicle collection unit, for which communication is provided, in particular a radio-based communication, especially to maintain the possibility to carry out such a communication at any time. For that, established communication standards may be provided, like via GSM-Data, GPRS or UTMS. For instance, a data transfer may happen with such kind of

communication via the internet, e.g. as e-mail as well.

In a potential design it may be provided in a waste disposal vehicle, that the collection system according to invention is connected with a computer-subsystem to a conjoint bus, e.g. a CAN-bus. For that, the collection system may feature a corresponding interface, just as the computer-subsystems applied in each case, so that compatibility is achieved through such a bus interface, which enables (via the collection system according to invention) the data collection of all connected computer-subsystems and the data storing for a subsequent communication.

In addition, in a design according to invention it may be provided, that the data collected by the individual computer-subsystems are supplemented furthermore with geographical data. For instance, at the time of the recording, positioning information, particularly GPS-information, may be recorded for the collected data namely those information of the position of the waste disposal vehicle on its tour.

The data may be stored together with the positioning information, so that it would be possible to join the data with the positioning information and subsequently to carry out an analysis in detail. Thus, an analysis may factor in local conditions. For example, the activities or dwell times taking place at a certain location can be recorded in this way and evaluated for future optimisations.

According to invention it may be designed, that during the data collection at least a part of the following information will be collected by the computer-subsystem: information about the operation of the filling, information

about the rotation angle of the filling, information about the speed rate of the filling, information about the engine speed, especially of the actuation of the filling, information about the pressure of the filling, information from the transponder of waste container, information about the speed of the waste disposal vehicle, information about the traveled distances, information about the weight of the collected waste etc.

The aforementioned data are stated as an example and are not listed completely. Depending on the application it would be possible to record any other data, depending on which data are provided by the relevant computer-subsystems. As mentioned above, it is preferred that the data of all computer-subsystems are provided. Thus, at a later point of time it can be determined which data become relevant for evaluation.

For enhancement of security, especially in the communication to-be-done it may be provided, that the data recorded by the collection system are further processed before the communication. With such processing it is about a coding for example. Hence it would be possible to transfer the data encoded and to carry out a decoding only after the receiving by the collection unit, in order to evaluate the data thereafter. So it will be ensured, that during the data transfer through any telecommunication networks there would be no data misuse.

An essential advantage of the method and waste disposal vehicle according to invention can be seen therein, that in a special design the collection system would collect only the data provided in the bus, but itself would not provide any data, particularly it would not send any information or instruction back to the relevant connected subsystem.

It must not inevitably be possible, that the collection system according to invention is able to communicate bi-directionally via the bus with the computer-subsystems. If applicable it would be possible, that this collection system is connected with the bus only in a passively hearing mode and only taps and records the data, which are passing the bus nonetheless.

The aforementioned communication for the data transfer from the in-vehicle collection system to an ex-vehicle collection unit may happen for example in a design, that the communication will be initiated by the in-vehicle collection system. For instance, such an initiation may happen if a communication condition would be met.

Such a communication condition can be seen for example, if a preset data quantity has been collected, thus an internal memory has been filled up in the meantime by the data collection and must be emptied, in order to enable further data collection. Therefore, the pending or completed memory-spillover constitutes a communication condition initiating the transfer of available data to the ex-vehicle collection unit, e.g. by one of the aforementioned methods.

Likewise it would be provided with another design, that the communication will be initiated by an ex-vehicle collection unit, e.g. on demand of a control center. In this way, the data of a waste disposal vehicle can be recalled at any time. For that it may be provided, that the memory of an in-vehicle collection system is dimensioned sufficiently, so that memory-spillovers are excluded during normal tours.

The special advantage of the method according to invention exists therein, that the waste disposal vehicle can go on-line under certain circumstances or - if applicable – always stays on-line, so that the data can be recalled at any time or transferred on demand. For that it may be provided, that the in-vehicle collection system maintains constantly a communication link with the ex-vehicle collection unit. This can be realised inexpensively particularly with the use of the internet as medium, e.g. with the use of flat rates as frequently offered nowadays.

Besides the initially mentioned possibility of an encoded communication, it would also be possible to store the collected data already encoded in the waste disposal vehicle. Thus it would not only be excluded, that the data are tapped illegally during the transfer, but also that the data are stolen from the waste disposal vehicle, e.g. with data media. Thus, in any way it would be ensured, that the collected data are available only to the relevant disposer.

A design sample of the invention is depicted in the following diagram.

The diagram 1 shows a schematic overview the arrangement of the waste disposal vehicle 1, without depicting in detail the individual vehicle components. Hereby it is intended according to invention, that the waste disposal vehicle 1 includes several computer-subsystems 2, like such computer-subsystems for the filling, the vehicle, the body or other computer-subsystems.

It is seen, that each computer-subsystem 2 is connected to a bus system combined for all computer-subsystems, which may be arranged by a CAN-bus 3. Besides the computer-subsystems, which

transfer their data each to the CAN-bus, it is intended according to invention, that also a collection system 4 is connected to the same CAN-bus 3, which essentially is arranged by a data storage, in which the collected data $D1 - Dn$ are received and stored.

Herewith, as depicted in the diagram, it can be intended, that these data are supplemented by PS-data, i.e. positioning information made available e.g. by a GPS-sensor 5. These data linked to the positioning information are stored in the memory of the in-vehicle collection system, for which a coding may be provided as well.

In the preferred design, an algorithm 6 would constantly check, whether a communication condition is met, like the collecting of sufficient data or a potential memory-spillover.

If the communication condition is met, the data may be transferred into a communication unit 8, which is also in-vehicle and with which the radio contact (of a non-depicted ex-vehicle collection unit) is made through a communication link, like GPRS, GSM-data-UMTS or others.

The collected data may be evaluated globally over all subsystems, whereby also correlations of the subsystems' individual data may be made between each other. Thus it is possible to optimise the tours of a waste disposal vehicle, to take on these optimised tour parameters for the waste disposal vehicle and for example also to monitor on-line during the optimised tour, whether the optimisation would arrive at the desired parameters.

Patent Claims

1. Method for the operation of a waste disposal vehicle, which at least includes a computer-subsystem recording and processing vehicle and/or activity data, in particular through sensors, **being characterised, that** the data (D1, ... Dn) at least of one part of the computer-subsystems (2), especially the data (D1, ... Dn) of each computer-subsystem (2), are collected by an in-vehicle collection system (4) and transferred via communication (9) to an ex-vehicle collection unit.
2. Method according to claim 1, **being characterised, that** the communication (9) is initiated by the in-vehicle collection system (4), in particular if a communication condition is met, especially if a preset data quantity has been collected.
3. Method according to claim 1, **being characterised, that** the communication (9) is initiated by the ex-vehicle collection unit.
4. Method according to claim 1, **being characterised, that** the in-vehicle collection system (4) maintains constantly a communication link (9) with the ex-vehicle collection unit.
5. Method according to one of the aforementioned claims, **being characterised, that** the communication (9) happens encoded.
6. Method according to one of the aforementioned claims, **being characterised, that** the collected data are stored encoded in the waste disposal vehicle (1).
7. Method according to one of the aforementioned claims, **being characterised, that** communication (9) happens via GSM-data, GPRS, UMTS.
8. Method according to one of the aforementioned claims, **being characterised, that** to the collected data (D1, ... Dn) the positioning information (5) of the

waste disposal vehicle is also recorded at the time of data recording, especially GPS-information, and the data (D1, ... Dn) are stored together with the positioning information (5), especially the data (D1, ... Dn) are linked with the positioning information (5).

9. Method according to one of the aforementioned claims, **being characterised, that** the in-vehicle collection system (4) for data collection is communicating with at least a part of the computer-subsystems (2), especially with all computer-subsystems (2) of the waste disposal vehicle (1) via a conjoint bus-system (3), in particular a CAN-BUS.
10. Method according to one of the aforementioned claims, **being characterised, that** during the data collection at least a part of the following information is collected by the computer-subsystems (2):
 - a. Information about the operation of the filling;
 - b. Information about the rotation angle of the filling;
 - c. Information about the speed rate of the filling;
 - d. Information about the engine speed, especially of the actuation of the filling;
 - e. Information about the pressure of the filling;
 - f. Information from the transponder of waste container;
 - g. Information about the speed of the waste disposal vehicle;
 - h. Information about the traveled distances;
 - i. Information about the weight of the collected waste.
11. A waste disposal vehicle with at least one computer-subsystem for the recording of vehicle and/or activity data, especially through sensors, **being characterised, that** it encompasses a collection system (4), with which the data (D1, ... Dn) at least of one part of the computer-subsystems (2), especially the data (D1, ... Dn) of each computer-subsystem (2), are collectable and transferable via communication (9) to an ex-vehicle collection unit.

12. A waste disposal vehicle according to claim 11, **being characterised, that** the collection system (4) is connected with the computer-subsystems (2) to a conjoint bus (3), especially CAN-bus.