

# Current technology innovation trends in trolleybus transport

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#### **Gdynia and its public transport system**



- **250.000** inhabitants
- Length of public roads: 395.5km
- Length of public transport routes: 244,4 km
- Motorization rate: 450 cars/1000 inhabitants
- Transport modes market share: **50/50** individual transport and public transport:



- 77% of all Gdynia inhabitants live within a 5 min. walk from a bus/trolleybus stop
- Trolleybus transport constitutes over 25% of the whole public transport

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transport in Gdynia by the Germans

2013– celebration of 70th anniversary of trolleybuses

**1943** – introduction of trolleybus

1998– setting up PKT Gdynia – an autonomous trolleybus transport operator engaged <u>only</u> in operation and maintenance of trolleybuses by separating it from general public transport organization

Trolleybus transport in Gdynia – a perfect example of combining TRADITION and MODERNITY – setting the context







#### Modern trolley depot and office building in Gdynia







## PKT present transport operation performance in numbers



- 87 trolleybuses
- 12 day trolleybus lines
- ca. 90 km of trolleybus traction
- 360 employes-including 214 drivers
- ca. 5 million vehicle kilometres a year
- 10 traction substations supplying power to the traction

# Trolleybuses constitute over 25% of the whole public transport in Gdynia





Project I - co-financed from European Regional Development Fund (2004-2006 programming period)



## Development of pro-ecological public transport in Gdynia

Increasing the access to ecological public transport and raising the efficiency of its functioning

#### **Realized Objectives:**

- building new trolleybus depot
- constructing new trolleybus lines (10.6 km of trolleybus traction single line) with 1 loop
- purchase of 10 new low-floor trolleybuses

Total cost of the project:14 m EuroCo-financing from ERDF:5.6 m Euro (50%)Implementation:2005-2007





Project II complementary to Project I - co-financed from European Regional Development Fund (2007-2013 programming period)



## Development of pro-ecological public transport in Tricity Metropolitan Area

**Realized Objectives:** 

- modernization of the traction network along the main streets of Gdynia and Sopot (11.5 km of trolleybus traction single line) with the reconstruction of 1 trolleybus loop
- construction of 4 new and modernization of 5 existing traction substations
- construction of Substations Remote Control Centre for enhanced and decentralized power management
- purchase of 28 new state-of-the-art low floor trolleybuses

<u>Total cost of the project</u>: Co-financing from ERDF: Implementation: 24.5 m Euro 13.6 m Euro (70%) 2010-2013



#### **TECHNOLOGICAL INNOVATIONS IN PKT PROJECTS**



#### Modern equipment in purchased Polish Solaris Trollino 12M

Automatic pantographs enabling automatic raising and lowering the current collector Asynchronic drive with energy recuperation system

Alternative power supply nickel-cadmium battery enabling off-traction emergency operation



### Air conditioning of the whole trolleybus space



#### **TECHNOLOGICAL INNOVATIONS IN PKT PROJECTS**





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#### DYN@MO Measure G2.1 Innovative hybrid trolleybuses with a new type of Li-ion battery running on a new line



#### PKT's CIVITAS DYN@MO objectives:

- Conversion of 2 used diesel buses into trolleybuses and installing in them an alternative power source – a new type of a battery from Lithium batteries family (Liyhium-ion – Li-ion) or buying 2 new trolleybuses with Li battery
- Choice of a new schedule trolleybus line regularly serviced by hybrid trolleybuses with a new battery – 2 trolleybuses getting off the traction and going for min. 2 km and max.15 km solely on the battery as the power source
- Expansion of trolleybus transport operation into new areas where so far traditional trolleys were not able to run due to the lack of the traction network
- Enhancing the reliability of the trolleybus transport
- Increasing the passenger space by the nominal number of 7persons due to battery smaller weight and size
- Reduction of energy consumption by 3% due to reduced weight of the vehicle







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## G2.1 Innovative hybrid trolleybuses with a new type of Li-ion battery running on a new line



- PKT will buy new trolleybuses with Li-ion batteries this year
- Available battery technologies, their characteristics and advantages have been thoroughly analyzed
- Most probably regular running of new Li battery trolleybuses will start in April 2015

#### WE WHOLEHEARTDLY INVITE YOU TO VISIT GDYNIA!!!

- Every year on 22 September Gdynia organizes the celebration of European Trolleybus Day (successfully funded by TROLLEY Project) in order to promote the trolleybus transport and disseminate PKT activities
- Gdynia is to submit its proposal to host a CIVITAS Study Tour in June 2015 to show, among others, PKT latest trolleybus solutions



Alternative power source – currently used 800 kg Nickel Cadium Battery (Ni-Cd) in a trolleybus; used in emergency due to its discharge characteristics







#### DYN@MO Measure G2.2 Supercapacitor for greater energy efficiency of trolleybus system in Gdynia

#### PKT's CIVITAS DYN@MO objectives:

- Reduction of electric power demand of the trolleybus system by 20% thanks to the installation of the supercapacitor cooperating with the traction network and state-of-the art trolleybuses with recuperation braking system (over 50% of PKT's fleet is equipped with it)
- Enhancing energy efficiency of trolleybuses and existing infrastructure
- Setting a national and European showcase of innovative technologies application in public transport

#### So far:

- PKT has conducted analysis of its traction network areas most predisposed for supercapacitor bank installation
- In May 2013 a tender for purchase of supercapacitor was published; in July a conract for its technical project, production, delivery, assembly and installation was signed; installation took place in April 2014; supercapacitor fully working now
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#### **ENERGY SUPERCAPACITOR**





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Wielkopolska Substation -**Localization of new** supercapacitor bank installations. This substation was predisposed for supercapacitor installation due to the mountainous character of the power supply area – there are more occurrences of trolleybuses braking and giving this recuperative energy back to the traction network; Supercapacitor 'catches' this energy and stores it for later use by other starting trolleybuses. 15



#### **Wielkopolska Power Substation**





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#### Wielkopolska Power Substation with a new supercap







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#### Thank you!

Marta Woronowicz, Project Manager

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