SEVENTH FRAMEWORK PROGRAMME

VIT
Vision for Innovative Transport

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SP4-Capacities - Research for SMEs

VISUAL SUPPORT TO THE AUTOMATIC HANDLING OF CONTAINERS:

THE CONTRIBUTION OF VIT

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AUDIENCE

The present document is filed as PUBLIC.

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The links between the VIT Project and the Metrocargo Initiative

The idea of an innovation in intermodality whereby containers and swap bodies could be shipped by single units to different destinations over a territory, rather than present day point to point trains, was conceived several ago.

The innovation consists in that trains and trucks could be each used for its best features: trains for low cost and low impact long distance transport, trucks for flexible short distance pickup and delivery.

The idea was to apply to load units the same concept of passengers transport, successively boarding different means as best fitted.

This was never done before because there was no practical way to load containers on trains in a rapid and cost effective way, as the overhead electric line made it impossible to use the traditional vertical loading devices, cranes and reach stackers.

New devices needed to be developed that could make loading and unloading fast and economical. The basic design was soon developed, but full engineering required resources and investments that the SMEs promoting the new system could not afford.

The mechanical design had been completed, but devices and SW were lacking for:

- precise and rapid detection of the corner fitting where the container was to be pinned
- verifying that the containers on an oncoming train were as foreseen in the load plan
- making sure no person enter the automated loading area
- predicting the effect of errors and perturbations on the overall performance of the system

The companies working on Metrocargo development, that could not afford to develop such devices and SW, applied for an EC-funded research project under the 7th Framework Programme to obtain expert research support.

The results of the VIT Project

During the first 12 months of the VIT project but independently from it, a full scale mechanical prototype was constructed and installed within the port area of Vado Ligure, Italy. The prototype was made available to VIT for installation and testing of vision equipment and of the mentioned performance predictive software.

In the months of the Project the devices and SW developed in VIT were tested on the prototype with the results described hereunder.

Vision system for load/unload

The vision system for load and unload was developed at early stages of the project at the request of the SMEs, as it impacts a qualifying and essential feature of the Metrocargo technology.

The first test were run in the factory were the Metrocargo prototype was being constructed, and were quickly successful. The knowledge developed was immediately transferred to the SMEs and incorporated into the prototype.

Problems arose when the prototype was installed in the open: the impact of direct sunlight and other disturbing factors caused an unacceptable error rate. The RTD performers worked on different wavelengths, type of devices and SW codes, and were finally successful to reduce the error rate slightly above the required value on various different illumination conditions, to full satisfaction of the SMEs, that consider this a major contribution of VIT.

Verification of correct train loading

The research on the verification, for safety purposes, that each container was correctly loaded and held in position by the retaining pins of the wagon, was formulated as a feasibility study due to the challenge of the objectives.

The original requests from the SMEs was to study a solution based on medium distance observations, to be redundant with respect to the close range vision system developed for load/unload.

The RTD performers showed through tests that the reliability level is not high enough to meet user requirements. Conversely, field tests showed that the close range view used for load/unload is effective for such tasks, to the extent that a redundant solution is not needed.

It was thus decided to use the load/unload vision system for verifying and documenting that each container is correctly loaded (i.e. all four corner pieces are well fitted on the wagon retaining pins).

The SMEs are satisfied that this way the correct loading is effectively verified and fully documented, to all effects including liability, insurance etc., and are incorporating this feature in the design of Metrocargo equipment.

Verifying the train composition

The objective of reconstructing the incoming train composition, i.e. the sequence of containers onboard, was reached with a very acceptable level of error, which becomes neglectable considering that the load plan of incoming trains are always known beforehand, the check serving as a verification to prevent errors that would indeed be tragic at this point (if a wrong container has arrived, this must certainly be known!).

The SMEs have acquired the relevant knowledge and include this feature in the planning of Metrocargo installations.

Video-surveillance infrastructure for human operator safety

Metrocargo being totally automatic, it is not designed to protect the safety of persons in the work area. A physical segregation of the work is not completely possible, so it is crucial that all human presence will be detected and machinery stopped before danger situations arise.

The VIT RTD performers developed video analysis modules to localise and track moving objects and decision support models distinguish humans from moving objects.

The relevant prototype was installed on the Metrocargo installation and is working to the satisfaction of the SMEs.

System security and data management

The SMEs needed a means to analyse the risk connected with faulty information from the vision systems and to evaluate the loss of performance due to errors by the vision devices.

The SW developed by the RTD performers was run on different scenarios and tested with good results. It made the SMEs confident that the rate of error of the visual systems does not seriously affect the performance of the system, and that safety of operation is not at risk.

Where do we go from here

Incorporating the knowledge and the SW and HW prototypes developed within VIT, the Metrocargo prototype has become a working demonstrator of the system and a “selling tool” and is being displayed to potential buyers.

An official presentation will be organised in March 2010, inviting government officials, port authorities and major logistic operators, with coverage by the specialised press that will spread information about the innovative loading system.

To gain further credibility, an agreement has been reached with Elsag SpA, belonging to the international Group Finmeccanica and well known for its expertise in automatic handling, to the effect that a program of tests will be carried out under their control in the first quarter of 2010.

Promotion and marketing is being actively pursued, and negotiations have started with several international entities – it is at this point necessary to keep reserved names and circumstances, that may however be disclosed in confidence to EC Officers.

Metrocargo has two marketing branches, that are both being actively tackled: the port to dry-port service and the creation of an inland logistic network. All calculations show that investments and operating costs are such that the Metrocargo service can be offered at very competitive prices, both for container handling in ports and for transport over a network.

On the port to dry-port side, it is anticipated that the first Metrocargo plant will be ordered within 2010, and commercial offers have been requested in non-European countries.

Regarding the inland network, negotiations are underway to set up the first element of the Italian network starting early 2011 and a newco will soon be established with an European partner to promote a network in that country.

Large international shippers have committed to make available considerable traffic (load units) to start the operation of the first line.

Technically, the electro-hydro-mechanical drawings are developed but need to be reviewed after the oncoming test campaign, also the SW controlling the terminal needs some completion and review after the tests.

The SW controlling the network has been designed in its general lines and needs to be completed

Financially, the promoters are negotiating with investors to obtain the resources necessary to complete the technical development and the working capital necessary to build the plants.