Cross-docking project: a case study

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1. Introduction

The data about Italian Energetic consumption, elaborated by Ministry of the Production Activities, highlight that the transport sector absorbs a percentage value of 32.7 on total national consumption of energy.
The distribution of energy consumption between the different transport methods is: 83.6% associated with road transport, 7.6% with air transport, 7.1% naval tanks (connected with fuel necessary to supply propulsion to ships), 1.2% with transport by rail and 0.5% with transport developed on waterway.
An analysis, concerning energetic sources used by means of transport, highlighted the total dependency on petroleum products (mainly gasoline and diesel).
It is obvious that an improvement of the efficiency about road transport of goods is the key to reduce energetic consumption, carbon dioxide, environmental degradation and freight costs.
These objectives have to match with an economic society that requires faster and faster transport of goods, guarantees about delivery and high quality of firm management.
Italy because of its geographical position in Mediterranean sea, because of its shape, because of its industrial structure (mainly based on small and medium firms), need to develop a more efficient transport systems of goods on an international, national, regional and urban scale.
It is possible to carry out these aims with a rationalization of means of transport about long distances and interchange points, with an improvement during collection of goods and their distribution on regional and urban scale.
In this work a case study is proposed in order to define the main steps carried out to design a cross-docking in Fano, a city located in the centre of Italy, in Pesaro-Urbino province.
This city is characterized by an economic infrastructure index of 69.5 while the national average value is 100. This is a measure of how important are logistic infrastructures in this province.
Cross-docking is a relatively new logistics technique used in the retail and trucking industries to rapidly consolidate shipments from disparate sources and realize economies of scale in outbound transportation. Cross-docking essentially eliminates the inventory-holding function of a warehouse while still allowing it to serve its consolidation and shipping functions. The idea is to transfer incoming shipments directly to outgoing trailers without storing them in between. Shipments typically spend less than 24 hours at the facility, sometimes less than an hour.
The improvements that are possible to obtain from cross-docking are important not only from economic point of view but also it gives the possibility to produce a reduction of noise pollution, road accident and urban blight.
The cross-docking project analysed in this work is made up of four steps:

1. first of all an analysis of the main parameters that characterize a cross-docking was carried out;
2. region characterization: economical and environmental analysis;
3. road traffic analysis of goods for the geographical area considered;
4. demand analysis of a sample of firms (factory firms and freight operators) using questionnaire; analysis of results.

2. Region characterization: economical and environmental analysis

The Region characterization phase took into account several aspects and it allowed us to define the importance of a cross-docking. First of all location of cross-docking was considered in order to create a connection with airports, railways, intermodal freight transport points and the main motorways and freeways of the country. An assessment of air pollution level was then carried out comparing average daily value of PM10 (Fig. 1) and NO2 with the value established by law.

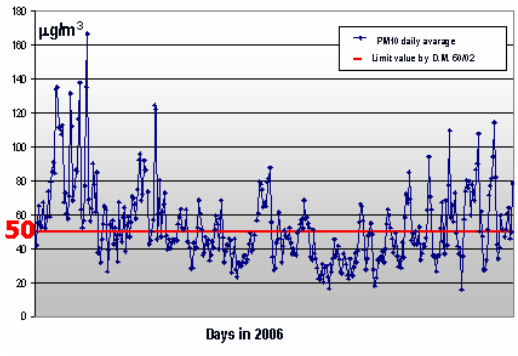

Fig.1 PM10 daily average value

Finally an economical analysis was developed in order to define the most important industrial sector in the region studied that could be interested in cross-docking project and the contingencies that they have from transport point of view.

3. Freight traffic by road analysis

An exhaustive study of freight traffic by road in the city of Fano allowed a clear view of the existing situation and a quantitative assessment of a cross-docking creation advantages. At First the study has been performed at the regional and provincial level and then locally. Regarding Marche Region, the following values has been identified:

- composition of the fleet of cars;
- on own behalf and on behalf of a third party transportation percentage;
- the total by road transportation with Marche Region as destination or provenance;
- the same total transportation divided by products macro-branches;
- equipment of infrastructures index.

Regarding Pesaro and Urbino Province has been identified:

- the transport by road companies divided by employees number;
- the equipment of infrastructure index;
- the traffic congestion level on provincial and state road.

Finally, regarding the city of Fano, the quantitative assessment of freight traffic flux that a cross-docking can draw has been realized. The freight traffic has been analyzed in two nodal points: the A-14 tollgate and state road E78 (Fig. 2).

Fig.2 The two nodal points: the A-14 tollgate and state road E78

The first one is important because it is the connection basis with the only highway in Marche Region along the Adriatic coast in north-southbound. The second one is important because it crosses the industrial area and it is the most important north-south thoroughfare of the city. to evaluate the Adriatic state road SS16, leaving out secondary roads, it would be necessary to analyze more accurately the traffic amount, but actually for Fano and neighbouring zones there are not update data.
These analyses show that the territory is characterized by an heavy freight traffic. Referring at 2006, the total amount of heavy vehicle movement is 626,000(sum of tollgates input and output) at tollgateand and 976,000(sum of fluxes in the two lane) at E78.

4. Questionnaire

A questionnaire has been achieved to collect information about organizational structure and operational requests of freight transport in Fano; the obtained information support for the statistical and mathematical analyses and confirm the results previously obtained. The questionnaire main scope has been to investigate:

- the main demand features, as elements to evaluate the economical convenience of a cross-docking creation;
- companies and transport operators' interest and subjective willingness to cross-docking services, let alone their opinion on advantages from cross-docking using;
- logistic and transportation problems that could be solved or reduced by using solutions given by the cross-docking.

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Two distinct questionnaires has been realized because of the different features of business and transport operators. The questionnaires are composed by a preliminary part that collect personal data and seven following sections that analyze:

- if corporate headquarters has been always in the same place or if it has been the object of a relocation;
- the technological companies' development, mainly as regard computer instruments;
- the main types of products moved, the total amount of material transported, the goods'

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destinations and proveniences, the number and typology of weekly loads, transport and packaging means used;

- the companies feet of vehicles to define the number and type of companies vehicles, their age and possible numerical fluctuation during the last five years;
- localization and logistical companies problems;
- the degree of interest in a cross-docking in the city of Fano and services companies would like to have in this infrastructure;
- the companies' kind of plant, equipment for material handling and services provided to customers.

5. Result analyses

Comparing results obtained by freight transport fluxes analyses and questionnaires, an assessment of market the cross-docking can draw and advantages of cross-docking in term of freight traffic reduction has been obtained.

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