
DIGITAL REACTIVITY METER DESIGN AND CONSTRUCTION FOR Tehran Research Reactor

H.MOUSAVI, H.KHALAFI

Abstract:

The paper illustrates designing and constructing of an online reactivity meter for nuclear reactors. As its input, this reactivity meter receives fission chamber's amplified output in a scale of milliamperes. The current is converted to voltage through amplifiers and I/V. After being converted from analog to digital by a microcontroller A/D device the digital signal is sent to a serial port. Then, the reactivity is calculated by MATLAB. Finally, results obtained from this reactivity meter are verified through tests conducted in Tehran Research Reactor.

Global financial crisis; the 1404 perspective in shadows

ALERASOUL, S., M.S, RAHAB Consulting Engineers

Abstract:

As the entire world is struggling with financial crisis, extensive traces of which is visible in peoples of various social classes and life-styles, it is one of the prime responsibilities of Payam Scientific/Strategic Journal to provide an analysis of the current situation from an expert technical standpoint. Hence, impacts of the global economic recession on Iran are addressed through briefly scrutinizing the country's topmost economic, political, and cultural development macro plan, the 1404 perspective. The author argues that, despite possessing invaluable resources in industrial, chemical, and energy sectors, the financial tsunami will gradually permeate the Iranian economy.



An estimation of the total turnover of a Multimodal transportation terminals (case study of Shahid Rajaie port)



Reza Moayedfar PHD of Transportation Engineering, RAH AZMOUN RAHAB Consulting Engineers ,Tehran, Iran.

Abstract

The purpose of the present study is to estimate and forecast the total turnover of the Multimodal transportation terminals and the Shahid Rajaie port as a case study has been considered. To do so, first some explanations have been presented in terms of familiarization and study of multimodal terminals and its structural models in different countries in the world. Then, the current status of patronage grounds of the especial economic zone of Shahid Rajaie port have been studied. Therefore, the proposed models in the especial economic zone of Shahid Rajaie port has been implemented and undergone sensitivity analysis and finally the results of the analyses and assessing the different options of sensitivity analysis on the present parameters in the model have been presented.

Keywords: Multimodal transportation terminal, Total Turnover, Sensitivity analysis

1- Introduction

The entity of transportation in the country's ports is mainly in a multimodal form. Since the transported cargo via sea should be transported into the country in one of the different forms of road or rail transportation. Or if it is transit cargo the cargo be transported to other countries. For this reason, in the ports, all multimodal terminals or in other words multi-purpose terminals which could serve the ground transportation vehicles for loading and discharging have been common. In other countries, for satisfying this need, they have embarked on creating and making Multimodal Terminals. These terminals are able to offer storage services, transportation implementation, loading and discharging operations, the classification and cargo merging organization of cargo collection, organization of final cargo delivery, coordination of cargo transportation current, special storages and parking spaces can satisfy the different needs of cargo transportation.

2- Definition of Multimodal Terminal

A Multimodal Terminal is a defined area in which all activities related to cargo transportation, logistic and distribution, domestic and international transportation are conducted by its different managers who can be presented as proprietors or

tenants of the buildings and their facilities (such as storage houses, centers for storing semi-bulk cargo, offices, parking). Also, for following the free competition rules, the Multimodal Terminal should have access to all companies related to above-mentioned activities. A Multimodal Terminal should also be facilitated with public facilities to serve the mentioned objectives. If possible, a Multimodal Terminal should include all public services for cargo and its users.

In order to attract the multimodal transportation for loading and discharging cargo, a Multimodal Terminal should preferably be served by different modes of transportation (such as road, rail, domestic waters, and air). Finally it is necessary for a Multimodal Terminal to be managed by the participation of both public and private sector. In fact, a Multimodal Terminal is created to concentrate the cargo transportation tasks in a vast space and area, also to prevent the excessive spread of storage houses, transshipment centers and preparatory bases of companies [1].

3- The Study of structural models of Multimodal Terminal

At present, the following main models have a great common use.

1. The Urban Model; which amalgamates the

transportation activities around big cities and alters the ground transportation models from trucks to smaller vehicles.

2. Italian Model (Interporti) model which combines the multimodal terminal with the railway transportation.

3. The Neighboring (or combined) port cargo transportation model with other port zones whose examples already exist.

4. The Simultaneous impressionity Model in which all parameters are affected by the creation of Multimodal Terminal at the same time [2].

4- The study of the current status of the especial economic zone of Shahid Rajaie port

The especial economic zone of Shahid Rajaie port, because of being placed in a special geographic zone and as an edge relating the borders of domestic borders with southern sea borders, through its visual and appearance can talk of the area's special performance with regard to climatic and cultural specifications. In conclusion, whatever makes up the appearance and facial features of the port, should be able to efficiently present the area's entity in a framework of general view to the observer. In fact, the urban view of Shahid Rajaie port defines on one hand the placement of applications related to the main performance of the port in the natural ground and in relation to the seashore in one side and the northern heights on the other hand. Also, it shows the relation of the volumes and vacant and full spaces. At present, the view which Shahid Rajaie port offers to the observer, both for road observers who enter the port through the national road network (from north) and the observers who enter the port through the southern sea paths, is a defined and special view and presents the special entity of the port. Therefore, the study and investigation of the present look can help keep the present outlook

better than presenting the construction rules and regulations, and in a mitigated case it can improve it.

4.1- Consideration of patronage grounds at especial economic zone of Shahid Rajaie port as a Multimodal Terminal

Zone no 5 which includes all storing lands of Shahid Rajaie port up to now consists of a two-part collection which is known as patronage grounds and 150-acre grounds. The patronage grounds which have the area of about 750 square acres totally are predicted for and allocated to storage purposes. According to previous studies, the development and conduction of stages related to its streets areas for delivering to its applicants is under way. The above-mentioned areas because of the following reasons carry the capability to be used as a multimodal terminal.

First, these grounds are vast enough for this use.

Second, in terms of transportation and regarding the place of the Shahid Rajaie port have the multimodal transportation forms, and regarding the access to different transportation types such as railroad, road and sea transportations are related to one another. The existing railroad in patronage grounds is connected to Bafgh-Bandar Abbas railroad and in terms of sea transportation it is connected to Persian Gulf waters, and road transportation is connected to transit road and north-south corridor. Also, the access to air transportation is available as Bandar Abbas air port is close to Shahid Rajaie port.

Third, the terminals in the especial economic zones of Shahid Rajaie port can be organized as multimodal terminals to transport the existing cargo to another form of transportation [3].

5- Proposing the Model

Our objective from offering our proposed model

is to study of the degree of improvement in the efficiency of Shahid Rajaie port's performance in terms of total number of activities of loading and discharging (export, import and cargo transit). In the case of using the patronage grounds of Shahid Rajaie port as a multimodal terminal. In order to estimate this considerable effect in the port's total turnover, as mentioned earlier, the simultaneous impressionity model is used. The simultaneous impressionity models include three famous mathematical models as follow:

1. The linear model with the general form of $y = a.x_1 + b.x_2 + \dots + c$
2. Cruff Model with the general form of $y = a.x_1^b .x_2^c \dots$
3. Exponential Model with the general form of $y = a.b^{x_1} .c^{x_2} \dots$

In which:

y: the dependent variable or total port's turnover to the separation of cargo groups.

x_1, x_2, \dots are independent variables or the related specific features to each port, (including area, capacity, the number of cranes, etc.)

a, b, c, ... the calibration coefficient

The required features and characteristics for doing the modeling are variables which have a role in the port's total turnover. These variables are:

1. The area of the port terminal.
2. the capacity of terminal (container, general, and bulk).
3. the number of cranes (rail crane and in the area)
4. the number and length of the existing docks in the port.
5. the cargo loading and discharging time (service time and waiting time).
6. the implementation of the proposed model in the especial economic zone of Shahid Rajaie port.

especial economic zone of Shahid Rajaie port

In order to conduct the modeling process, according to the related features of Shahid Rajaie port which were mentioned in the previous section, using the SPSS9 software the mentioned models were calibrated for an 11-year period (1991-2001) [4], then it was evaluated according to the 2002 data. It is worth mentioning that in some models because of coefficients of single variables used in the model were not statistically significant, some integrated parameters such as dock length to the terminal area. The length of dock to the area of terminal, the number of the cranes to the area of the terminal and etc, have been used.

Different types of the used parameters are presented in Table 1.

The modeling trend has been conducted in a way that the combination of different variables in the model according to statistical tests including R2 (for determining the correlation among the independent variables and among dependent variables, T-test (for determining the significance level of the combination of the model in relation to the dependent variables), F-test (for determining the significance level of the combination of the model variable in relation to the dependent variable), and model evaluation according to the percentage of error compared to the reality) has been measured and finally the best combination has been proposed as the optimum and best model.

The calibrated models of Shahid Rajaie port has been presented in Table 2.

Having considered table 2, R2 of all models are between 0.95 and 0.98 which shows an appropriate correlation between the dependent variable that is the total turnover of the ports and the independent variables (the port features). The value/amount of T-test and F-test in all models regarding the significance of independent variables and correlation of each independent variable and dependent variable

6- Demodulation of proposed model to

Table 1: Several used parameters at modeling process

Parameter Type	Title of Parameter	Abbreviation	Comments
Single Parameter	Terminal Area	Ta	---
	Terminal Capacity	Tc	---
	Total number of Cranes	Nc	---
	Number of Docks	Nd	---
	Length of Docks	Ld	---
	Service Time	St	---
	Waiting Time	Wt	---
Composed Parameter	Terminal Capacity to terminal area	Tcu	Tc/Ta
	Number of cranes to terminal area	Ncu	Nc/Ta
	Number of Docks to terminal area	Ndu	Nd/Ta
	Length of Docks to terminal area	Ldu	Ld/Ta
	Average length of each Dock	Lda	Ld/Nd
	Service time to Waiting time	Swt	St/Wt
Performance Parameter	Total Container Turnover	Cco	---
	Total bulk turnover	Bco	---
	Total general cargo turnover	Gco	---

Table 2: Calibrated models at Shahid Rajaie port

Shahid Rajaie port general cargo						R2	F test	Percentage of evaluation error
						0.95	Good	15
t-test	constant value	1 st variable	2 nd variable	3 rd variable	4 th variable			
	---	Bad	Good	Good	---			
Shahid Rajaie port Bulk cargo						R2	F test	Percentage of evaluation error
						0.98	Good	15
t-test	constant value	1 st variable	2 nd variable	3 rd variable	4 th variable			
	---	Bad	Good	Good	---			
Shahid Rajaie port Container cargo						R2	F test	Percentage of evaluation error
						0.98	Good	1
t-test	constant value	1 st variable	2 nd variable	3 rd variable	4 th variable			
	---	Good	Good	Good	---			

Table 3: Total turnover of Shahid Rajaie port based on model & observation (2002)

Shahid Rajaie Port	Bulk Cargo (1000 ton)	General Cargo (1000 ton)	Container Cargo (Teu)
Observation	13302		809905
Model	11217		805022

Table 4: Sensitivity analysis of calibrated models at Shahid Rajaie port (2011)

General Cargo	20% increase in number of cranes	20 % increase in Dock length	20% decrease in service time
	4% increase in total turnover	35% increase in total turnover	18% increase in total turnover
Bulk Cargo	20% percent increase in admission capacity	20 % increase in Dock length	20% decrease in waiting time
	4% increase in total turnover	19% increase in total turnover	3% increase in total turnover
Container Cargo	20% increase in terminal area	20% decrease in service time	20 % increase in Dock length
	28% increase in total turnover	1% increase in total turnover	No change

is completely appropriate. The low amount of average error of evaluation, that is, the difference between the results of model and observation in 2002 illustrates the accordance of model with the reality.

The total turnover of Shahid Rajaie port during 1990s obtained from the model and observation is illustrated in graph no 1 to 3.

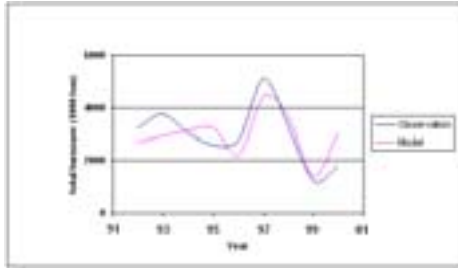


Figure 1: The total turnover of Shahid Rajaie port during 1990s obtained from, model and observation (General cargo)

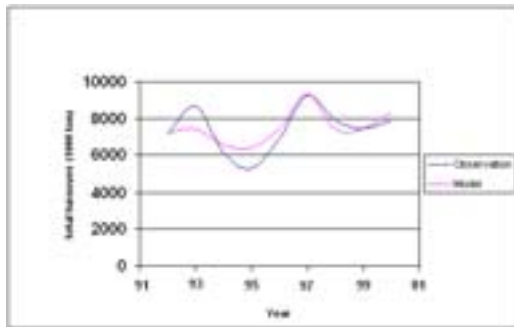


Figure 2: The total turnover of Shahid Rajaie port during 1990s obtained from, model and observation (Bulk cargo)

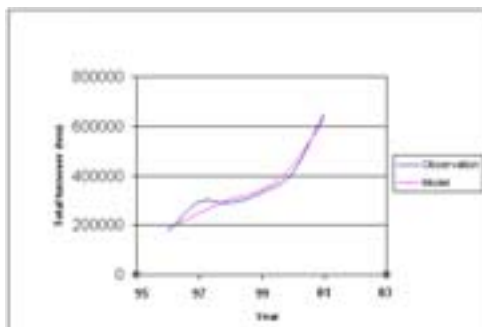


Figure 3: The total turnover of Shahid Rajaie port during 1990s obtained from, model

and observation (Container cargo)

Considering the presented graphs, the approximate accordance of the model curve and the observation curve for the three groups of cargo, that is, bulk cargo, general cargo and container cargo is a witness of the appropriate accuracy of the calibrated models of Shahid Rajaie port. The total turnover of Shahid Rajaie port has been shown in table 3.

6.1- Sensitivity analysis

As it was mentioned earlier, creating a Multimodal Terminal in patronage grounds of the especial economic zones of Shahid Rajaie port and increasing the loading and discharging facilities in the port, it could make an improvement over the port characteristics or features such as number of cranes, terminal capacity, dock length, service time and waiting time. This improvement increases the first 3 characteristics and decreases the second 3 characteristics.

In order to study the effect percentage of each of the mentioned parameters in the total turnover in the project horizon, the calibrated models underwent the sensitivity analysis. To do this, first it is necessary to predict the year of project horizon. In order to predict the total turnover of Shahid Rajaie port in the project target year (2011). First, the related characteristics of the port such as terminal area, its capacity number of cranes and etc, considering the trend of its changes during 1990s can be predicted and then using the calibrated models for Shahid Rajaie port in the project horizon year 2011 in bulk cargo groups is equal to 9930 thousands tons, in general cargo group 2900 thousands tons, and in container cargo group would be equal to 1404000 teu.

The results of sensitivity analysis process are shown in Table 4.

Considering table 4, in the case of implementation of Multimodal Terminal and increase in the loading and discharging facilities in Shahid Rajaie port, the 20-percent increase in the dock length in the case of two groups of bulk cargo and general cargo would leave a more considerable effect on the port's total turnover (35%) in comparison with other existing parameters in the model. After this parameter, the average service time per ship (19% increase in total turnover) is the second considerable parameter. In the case of container cargo, terminal area parameter with 28% increase in the total turnover would have the biggest increase in the total turnover of the port comparing to the other parameters, dock length and service time.

7- Conclusion

The evaluation of the sensitivity analysis of the three bulk, general and container shows that the parameters such as dock length, terminal area and average service time per ship can have a considerable role in changing the total turnover of the port, but implementing improvement in the mentioned parameters at the same time would have a more considerable effect (for example, the 20-percent increase of the dock length and 20-percent decrease in the service time in a simultaneous

way would lead to 52-percent increase in the total turnover of general cargo). This means that creation of the Multimodal Terminal in patronage grounds of the especial economic zone of Shahid Rajaie port without increasing the loading and discharging facilities admission capacity, number and length of docks in the port can only affect and decrease the cargo average waiting time in storage—because of the fast and quick transportation of cargo from port to Multimodal Terminal and then to the final destination. This, considering the results of sensitivity analysis could have a slight effect on the improvement of Shahid Rajaie port's total turnover. Also, increasing the loading and discharging facilities, admission capacity, the length and number of the docks, etc., of the port without creating the Multimodal Terminal and appropriate backshore facilities for transporting discharged cargo to the final destination and also quick transportation of the cargo into the port to load the ships can considerably increase the average waiting time of the cargo in the storage and service time for each ship which results in lowering the port efficiency and its total turnover.

8- References

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