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THOMSON REUTERS
[SCRICE-2018]
ISSN 2348 – 8034
Impact Factor- 5.070

GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES

INTEGRATED APPROACH OF GIS AND GPS FOR EQUIPMENT MANAGEMENT IN CONSTRUCTION INDUSTRY IN MUMBAI CITY

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ABSTRACT

Good project management includes effective and efficient use of labour, material and equipment resources on construction site. Construction equipments are considered to be one of the most important resources. It is important to choose proper capacity and types of equipments for a particular work which requires selection of the most feasible construction equipment supplier of the city. Improper supplier selection may result in the problems of cost and time overrun. There are many methods for selection of supplier which involve statistical analysis, making them time consuming. With the help of GIS database, supplier selection can be done in very less time, as it being a very effective tool for database management. The spatial and non-spatial data for this study is formed by collecting Name of supplier, address, location, type of equipment, number of equipments, rental and purchase policy, cost of equipment, rental price of equipment and delivery facility, by carrying out a questionnaire survey. This spatial and non spatial data about equipment suppliers is then stored into the GIS database using GIS software. Queries have been developed in GIS software to find out supplier's location, equipment availability, and shortest route from the site. This study stands as a guide for the use of GIS software for ideal supplier selection in very less time

Keywords: Equipment management, supplier selection, GIS software, Database, spatial and non spatial data.

I. INTRODUCTION

Construction industry is an integral part of growing economy of country, so it is important to do proper construction equipment management. Construction equipment management includes selection proper equipment supplier of the city to save cost and time overrun.

A) Equipment management

The process of balancing the expense and use of a construction equipment against the timelines and the income from the project can be called as a equipment management. The cost of equipment in a project varies from 10-30% of the total cost of project, depending upon the extent of mechanization. Proper planning, selection, procurement, installation, operation, maintenance and equipment replacement policy are important factor in construction management. Selection of proper equipment contributes to economy, quality, safety and timely completion of a project.

The selection of the appropriate type and size of construction equipment often affects the required amount of time and effort and thus the job-site productivity of a project. It is therefore important for site managers and construction planners to be familiar with the characteristics of the major types of equipment most commonly used in construction.

B) **GEOGRAPHICAL INFORMATION SYSTEM (GIS)**

A Geographic information system is a computer – based system capable of capturing, storing, and analyzing and

ISSN 2348 – 8034
Impact Factor- 5.070

Displaying geographically referenced information; that identified according to location. This helps in storing data of numbers of supplier in a city

C) The Global Positioning System (GPS)
The Global Positioning System (GPS) is a satellite-based navigation and surveying system for determination of precise position and time, using radio signals from the satellites, in real-time or in post-processing mode. Which is useful for getting location of particular supplier and its distance from site.

II. CASE STUDY

A) Study region - Mumbai city
Mumbai is capital of Maharashtra. It is largest financial centre of India. It highly populated city with population of 18.4 million. Total area of Mumbai city is 603.4 square meter.

Mumbai is important economic centre of India. Faster development and increasing population of Mumbai city increase scope in construction industry. Daily new construction activities are taking place and load on construction industry is increasing day by day because of this contractors are facing many problems like delay in completion of a project, cost overrun, shortage of labour etc. To overcome this problem proper management of material and equipment is necessary.

B) Data acquisition-
There are many construction equipment suppliers available in Mumbai. The scope is restricted to excavator and concrete mixture only. Collection data includes Name of shop, Name of owner, Type of construction equipments, Cost of equipment, Rent of equipment, Location of construction equipment supplier etc. Mumbai city map is collected from Survey of India. GIS software used is GRAM++ and it is collected from IIT Bombay.

III. APPLICATION OF GIS MODULE

1. Geo registration-
Step 1- Creation of Mumbai city map vec file
Step 2- Open image in Map edit
Step 3- Add tick mark to four corner of map

Figure 1 Addition of tic mark

Step 4- Calculate error
2) Formation of different layer in Mumbai city map
a) Outer boundary layer of Mumbai city map (polygon layer)
b) Road network layer of Mumbai city map (Segment layer)
C) Supplier location layer (Point layer)

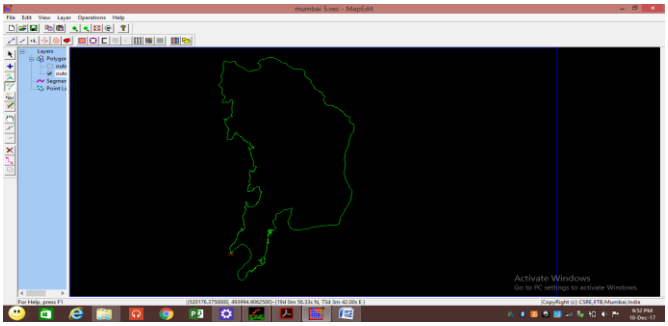

Figure 2 formation of outer boundry layer

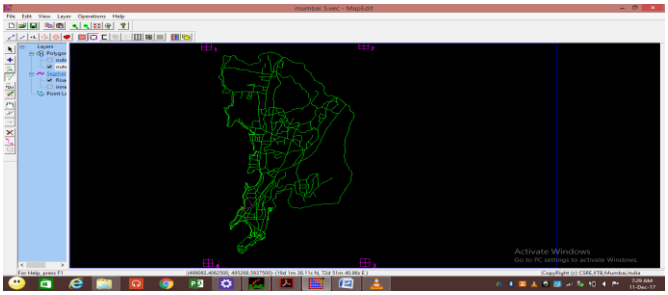

Figure 3 Formation of road network layer

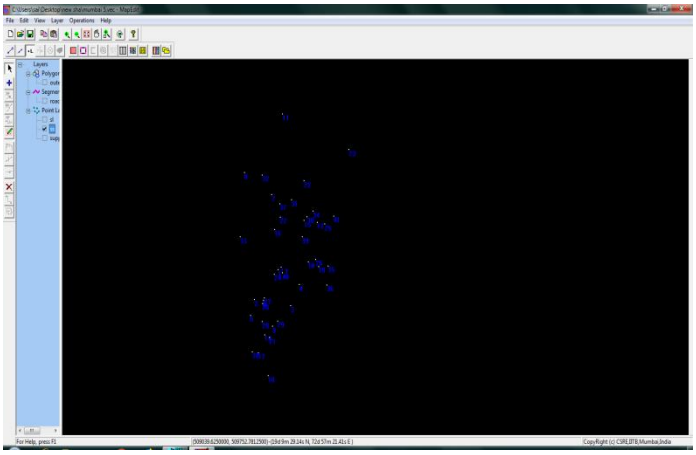

Figure 4 formation of supplier location layer

3) Digitization of map
4) Formation of polygon

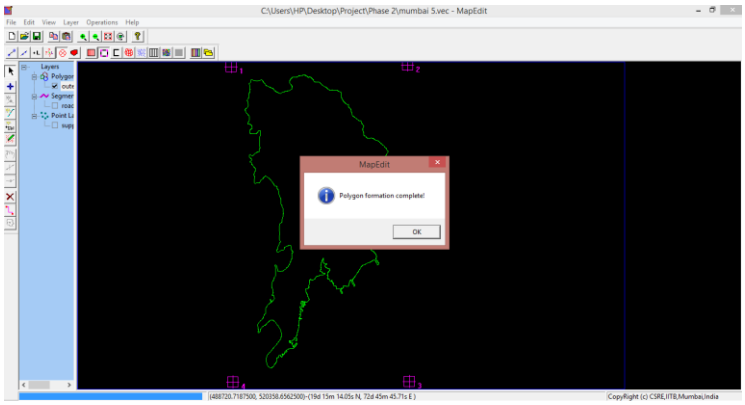

Figure 5 Polygon layer complete

5) Addition of label to all layers
6) Table creation of supplier location
7) Creation of database for supplier location layer

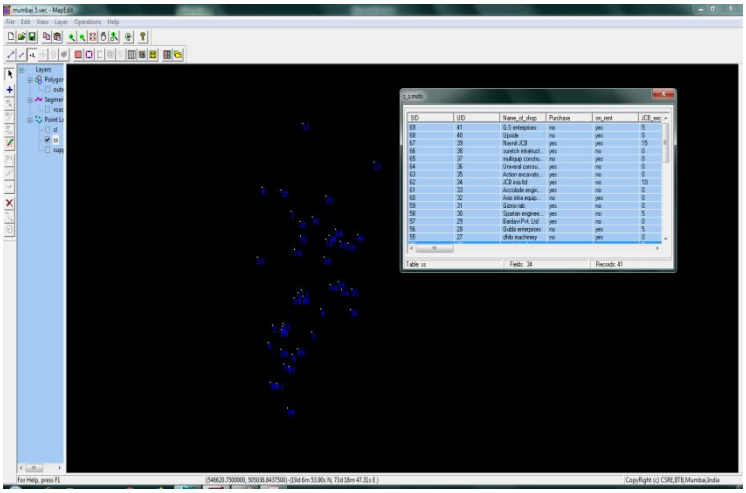

Figure6 Creation of table

8) Adding information about supplier to the database.

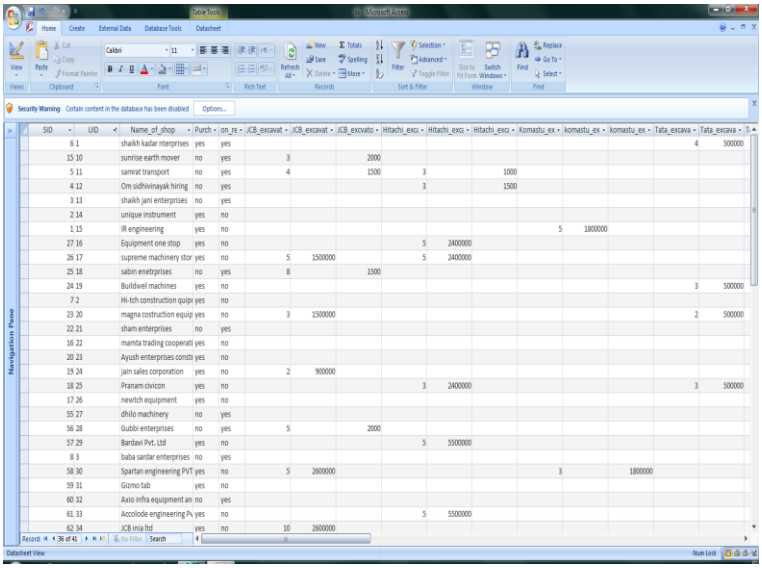

Figure 7 Creation of database

9) Generation of queries

Different queries can be run into Vector analysis. Vector analysis includes Vector queries, TIN, Network analysis. Mumbai city map Database file is used for queries. By running different queries different solution can be easily find out. Information about available stock of equipments, rent of equipments, and cost of equipment of different equipment.

Supplier can get by running queries in less time. Also it is used to compare more suppliers and evaluate each supplier.

A) Query no 1

Find out non tilting type of concrete mixture with cost less than 45000 and Condition of this query is " non_tilting_type_concretemixture_cost<=45000. This query is important because budget of project can be less so it is important to select supplier having equipment within budgeted cost. And the result is 2 of 41 software have non tilting type concrete mixture with cost less than 45000

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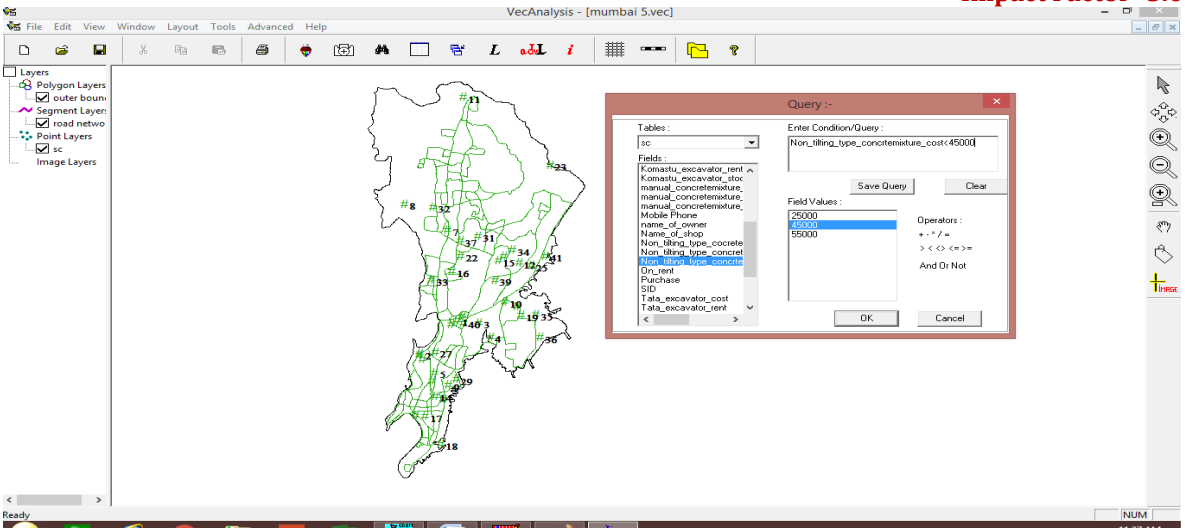


Figure 9.1.1 Running query no 1

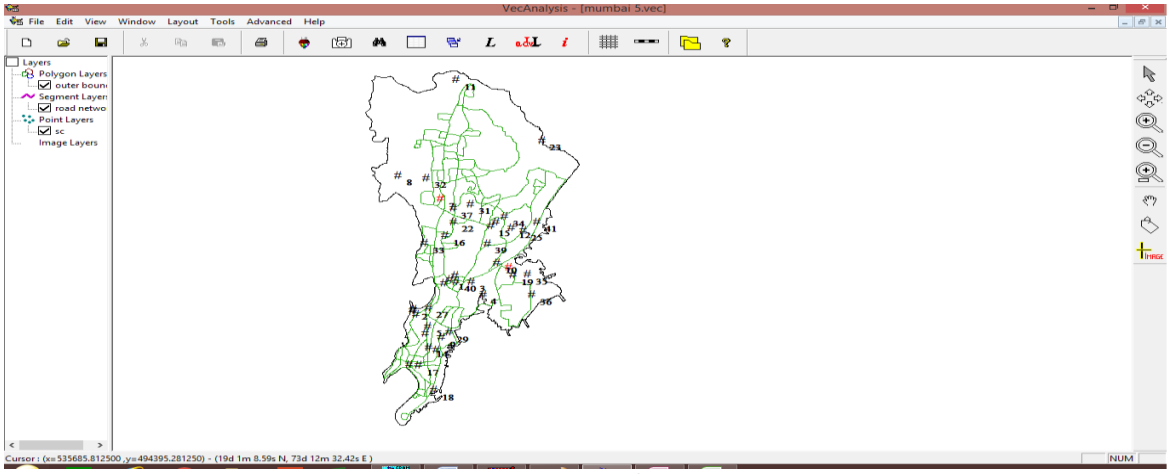
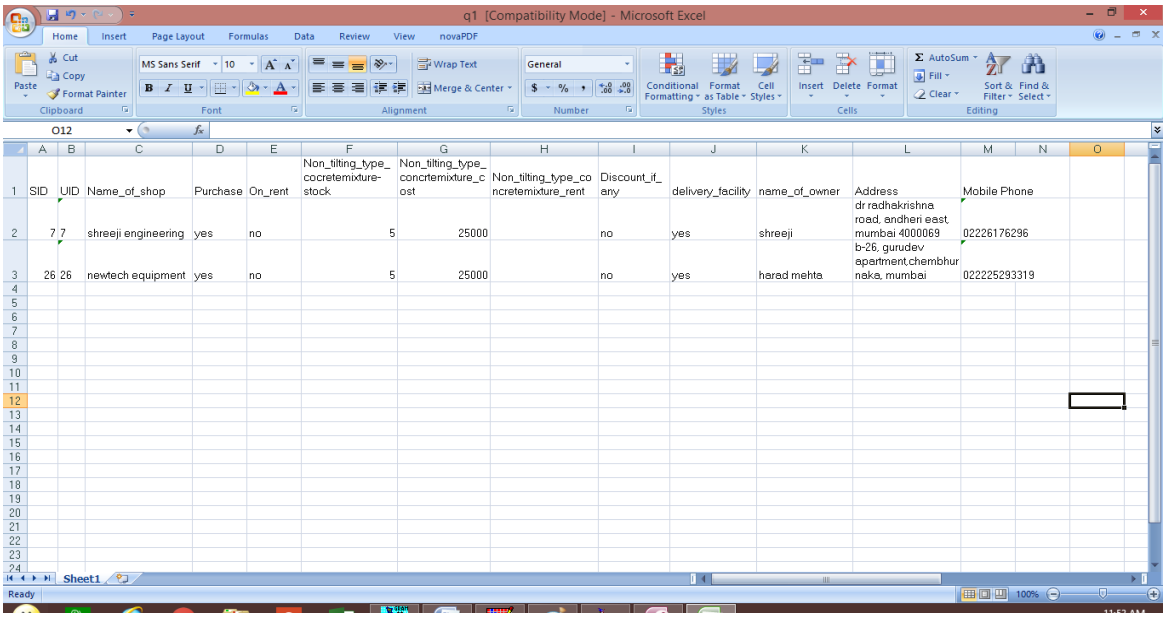


Figure 9.1.2 Result of query no 1



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	SID	UID	Name_of_shop	Purchase	On_rent	Non_tilting_type_concretemixture-stock	Non_tilting_type_concrtemixture_cost	Non_tilting_type_concretemixture_rent	Discount_if_any	delivery_facility	name_of_owner	Address	Mobile Phone		
2	7	7	shreeji engineering	yes	no	5	25000		no	yes	shreeji	dr radhakrishna road, andheri east mumbai 40000069	02226176296		
3	26	26	newtech equipment	yes	no	5	25000		no	yes	harad mehta	b-26, gurudev apartment,chembhur naka, mumbai	022225293319		

Figure 9.1.3 Result of query no 1

2. Query no 2

To find out Tata excavator with 4 number of stock available and Condition for this query is "Tata_excavator_stock=4". It is important to make available required numbers of equipment on site to stop delay on site and this condition is useful to find equipment supplier with required number of equipment. And result of this query is 2 out of 41 equipment supplier having four number of Tata excavator.

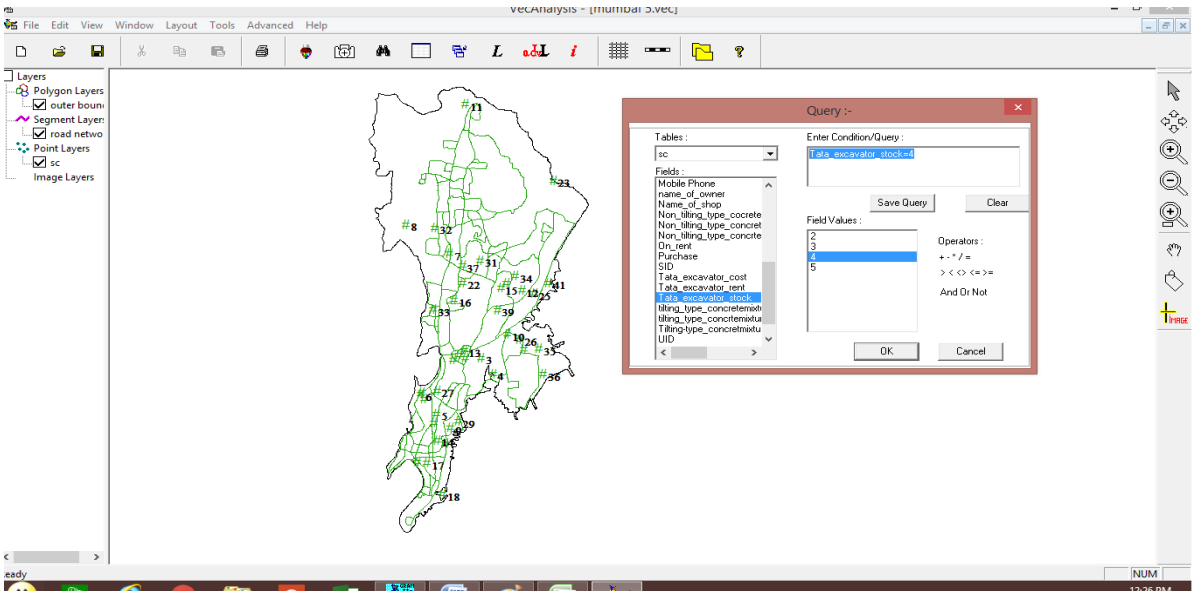


Figure 9.2.1 Running query no 2

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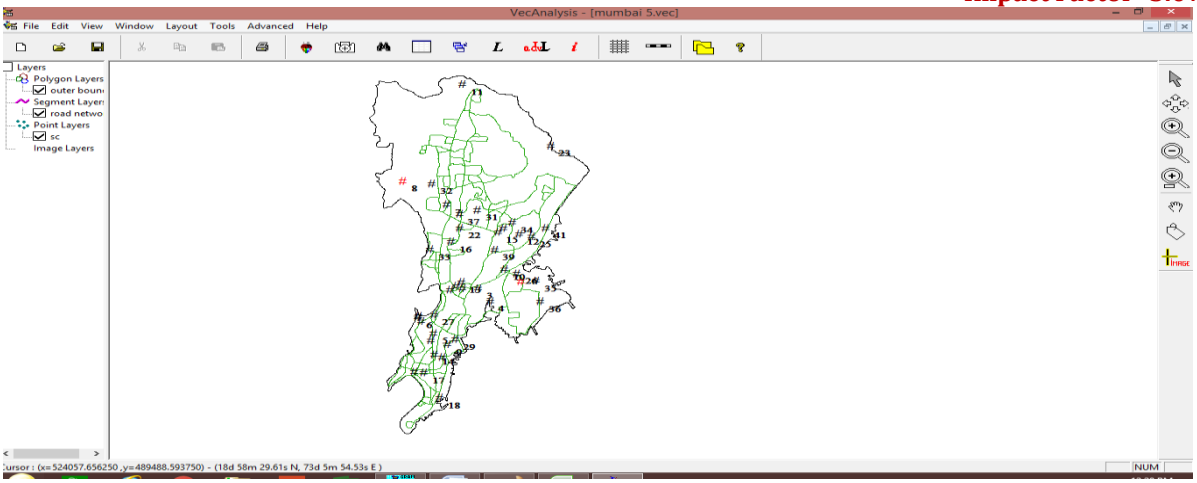
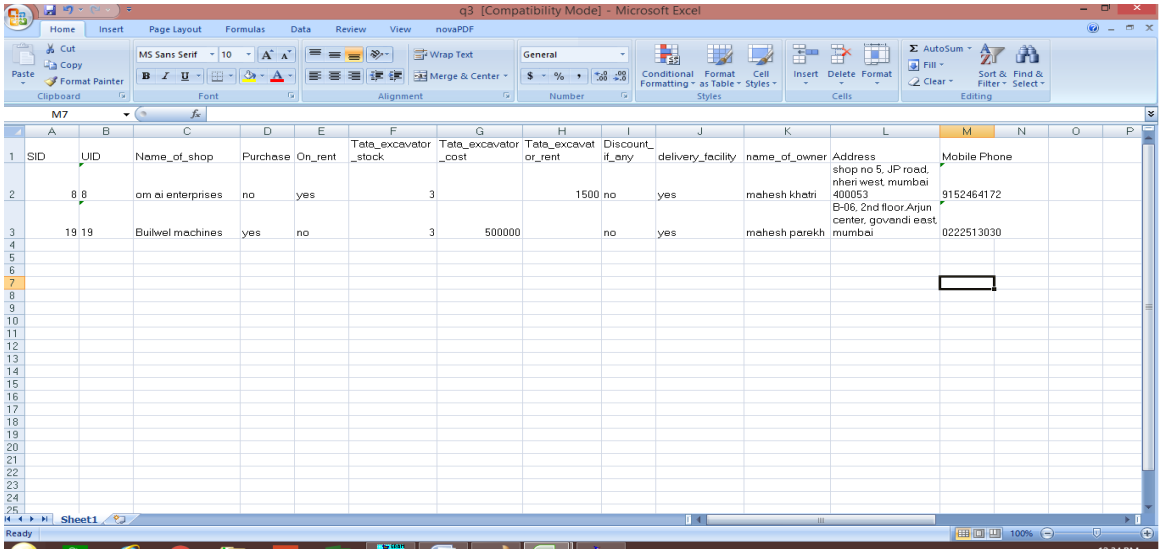


Figure 9.2.2 Result of query 2



	SID	UID	Name_of_shop	Purchase	On_rent	Tata_excavator_stock	Tata_excavator_cost	Tata_excavator_rent	Discount_if_any	delivery_facility	name_of_owner	Address	Mobile Phone
2	8	8	om ai enterprises	no	yes	3		1500	no	yes	mahesh khatri	shop no 5, JP road, nheri west, mumbai 400053	9152464172
3	19	19	Builwel machines	yes	no	3	500000		no	yes	mahesh parekh	B-06, 2nd floor,Arjun center, govandi east, mumbai	0222513030

Figure 9.2.3Result of query no 2

IV. RESULT

- There are many methods for selection of proper supplier, which involves statistical analysis and hence it is time consuming. But with the help GIS database proper equipment supplier can be selected in less time.
- In other method of selection of supplier it is necessary to collect the data of supplier every time, data can not be saved but by using GIS software data can be stored into Database which is time consuming.
- Vector analysis is important factor in selection of supplier. It gives categorized supplier data as per requirement and given condition in very short time.

V. CONCLUSION

Equipment management is necessary part of construction management. It is important to choose good quality of equipment to maintain smooth construction on site and it is possible by selection proper construction equipment supplier of the city. With the help of GIS Tool Company would be able to make appropriate decision about selection construction equipment supplier of the city in very short time. GIS tool can save all data about supplier into database

and required supplier can be selected by providing requirement and condition to database. Selection of construction equipment supplier with the help of GIS tool is time consuming and it can avoid cost overrun.

VI. ACKNOWLEDGMENT

I would like to Thanks Survey of India for providing Mumbai city map. I would like to thanks all Construction equipment supplier, manufacturer for their support for providing data required for project. Also I would like to thanks IIT Bombay for providing GIS software required for project.

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