

An Application On Determining Of Optimum Local Transporting System At Adapazari City

Taskin Kamil, Gumus Fatih¹, Akaytay Ali²

1 Sakarya University, Business Faculty, , Sakarya, Turkey,

2Duzce University, Business Faculty, Duzce, Turkey

E –mails: *ktaskin@sakarya.edu.tr, fbgumus@sakarya.edu.tr, akaytay@sakarya.edu.tr*

Abstract

Adapazari Town is the management center of the Sakarya City and the biggest town of Sakarya. Transportation in Adapazari City is being provided by Municipality buses, minibuses, shared taxi and special buses. This has been both caused a deepen conflict which is hard to be manage and intensive traffic problem. There is an intensive competition among the minibuses, shared taxi and special buses. This situation has been reflected to Municipality buses negatively. Additionally, all passenger vehicles have been working with idle capacity. This means that there are lots of passenger vehicles which working with idle capacity and uncomfortable .

We calculated these specialties of minibuses and shared taxies at this study at below;

- Idle Capacities
- All expenditures
- Daily, monthly ann annual incomes
- Daily circle number
- Capacities at new model
- All expenditure at new model
- Daily, monthly ann annual incomes at new model

At our model, minibuses and shared taxies have been combined and have gotten active on their new routes. At our model includes these profits;

- The more relaxed traffic.
- The more suitable and comfortable passenger transportation.
- The more profits level for minibuses and shared taxies.
- The less and fasten routes

Keywords: Transporting, Optimum level, New Regulation, Optimum Capacity, Idle Capacity.

1.THE AIM OF THE STUDY

This application study was performed in Adapazarı city which is the central settlement unit of Sakarya metropolitan municipality. Our study focuses on cities' transportation problem. Sakarya and its center Adapazarı cities are developing settlements units of Turkey. Sakarya and Adapazarı cities have increasing population number. These numbers are given at Table 1 at below: ([http://tr.wikipedia.org/wiki/Sakarya_\(il\)#N.C3.BCfus](http://tr.wikipedia.org/wiki/Sakarya_(il)#N.C3.BCfus))

YEAR	SAKARYA	ADAPAZARI
2008	851.292	237.259
2009	861.570	243.204
2010	872.872	251.112
2011	888.556	254.458

TABLE 1: Population Numbers Of Sakarya And Adapazarı Cities.

As it is seen at Table 1, Sakarya And Adapazarı Cities' population numbers have been increasing along the years. In addition to this information, Sakarya cities' economical weigh increased among the other cities of Turkey. Countries' top ten cities' export numbers are at Table 2 at below: (<http://www.tim.org.tr/tr/ihracat-ihracat-rakamlari-tablolar.html>)

Ranking	City	Export Total	%
1.	İstanbul	51.833.871	46,18
2.	Bursa	10.927.885	9,73
3.	Kocaeli	8.880.173	7,91
4.	İzmir	7.201.910	6,41
5.	Ankara	5.186.288	4,62
6.	Gaziantep	3.887.663	3,46
7.	Manisa	3.524.252	3,14
8.	Denizli	2.143.886	1,91

9.	Hatay	1.732.129	1,54
10.	Sakarya	1.665.431	1,48

TABLE 2 : Turkey's Top Ten Export Totals According To Cities.

As it seen Table 1, Sakarya has very important place and ranking in Countries' economical performance. Sakarya made export 1.665.431 \$ export in 2011 year and the share of this total in sum number is % 1,48.

Table 1 and table 2 shows us Sakarya and Adapazarı cities are deveoloping cities in Turkey cities. This has been bringing more advantages. For example, a great number of big factories and small and medium sized factories have opened up to 2012. This situation accelerated especially at new millenium. Besides, there are lots of market and shopping center have been opened. These progresses brought some problem to Adapazarı city especially at transportation topic.

Transportation in Adapazarı City is being provided by Municipality buses, minibuses, shared taxi and special buses. Nearly ten years ago, city is smaller than now and transportation was not big problem. After the earthquake in 1999, city was planned again and new settlement areas established which are far from the city nearly 20 kilometres. Some people chose to live around the city not in it. This situation caused the transportation problem because the city expanded the wide area after the earthquake. 4 transportation type is more excessive and complicated for the city. These transportation type's routes have been crossed and this caused negative competition and discomfort in people. Because of these situations, we aimed to solve conflict and suggest a new plan for cities' transportation system. The aimes of our study are determined in some titles. These are given at below:

- If minibuses turns into buses, what is the new profit of the owner of the minibuses.
- Compare of buses and minibuses' profit, expenses and incomes.
- If minibuses turn into buses, how many buses are sufficent for city transportation.

2.CURRENT SITUATION OF CITY TRANSPORTATION

As it seen above, there are 4 alternatives for inner city transportation. These are Municipality buses, minibuses, shared taxi and special buses. Adapazarı city has not tramvay and metro line. Municipality buses, minibuses, shared taxi carry the passengers at inner city. Special buses carry the passengers from the out of the city to inner city. In recent years, special buses having kart54 have been carrying passsengers at inner city.

Minibuses and shared taxies have dominated to transportation system of the city. There are 416 minibuses and 320 shared taxies on the road. In one year, Sakarya metropolitan municipality sold some long buses having more share in transportation. In addition to this, Sakarya metropolitan municipality has been put pressure on minibus owner about buying new

and long buses. Because minibuses and shared taxis cause traffic stir and have not modern and comfortable environment. Minibuses are 14 peoples capacity and shared taxis are 7 peoples capacity. Because of capacity problem and comfortable inner design, turning into buses is inevitable situation for these vehicles. This means that minibuses and shared taxis are inadequate for cities' transportation especially for recent years.

3.MINIBUS TRANSPORTATION

416 minibuses have been carrying passengers at 13 different stations. Some stations have different subline. Other specialities of minibuses are at below;

- Total market price of minibuses is 87.000.000 million US\$
- It constitutes of 13 stations and 27 subline.
- Nearly 90.606 passengers are being carried by minibuses in a day.
- Nearly 33.070.030 passengers are being carried by minibuses in a year.
- All minibuses are turning around the World 2,25 times in a day.
- 37.797.740 km have been taken by minibuses in a year.
- 3.403.586 liter diesel have been consumed by minibuses. This makes 13.614.344 Turkish Liras expenditures.
- Nearly every lines have been crossed with ather vehicles lines.
- Some minibuses' line price is higher than others because of profit level of their line.

4.METHODOLOGY

We traveled all stations to reach our studies goals. We got some information about minibüs station and their features. Some station information and getting methods have been given at below:

- Ticket price is taken by station officer. Ticket prices are different at student and civil person. In addition to this, these prices are different at different staaions.
- Passenger number carried by minibuses are calculated in minibuses by pollster. How many student and civil person are being carried by minibüs calculated separetaly. This calculated in accordance with morning, noon, evening timezones, summer and other seasons at the same time.
- Every replacement parts of minibus and buses were taken by oto markets.
- Line lenght of every line calculated in minibüs.
- The last 3 minibuses selling prices were taken from each stations.
- Departure time of minibuses were calculated at every station at the base on timezones (Morning, noon and evening).
- Circuit time of line were calculated at every station in minibus.

5.FINANCIAL COMPARANCE OF EACH LINE OF MINIBUSES

In this section, we showed line price, profit of the line and amortisation time at one figure. In according to figure 1, line price, profit of the line and amortisation time are compliant with each other. The most profited line has the most priced minibuses. At the most profited line, amortisation time is the smallest.

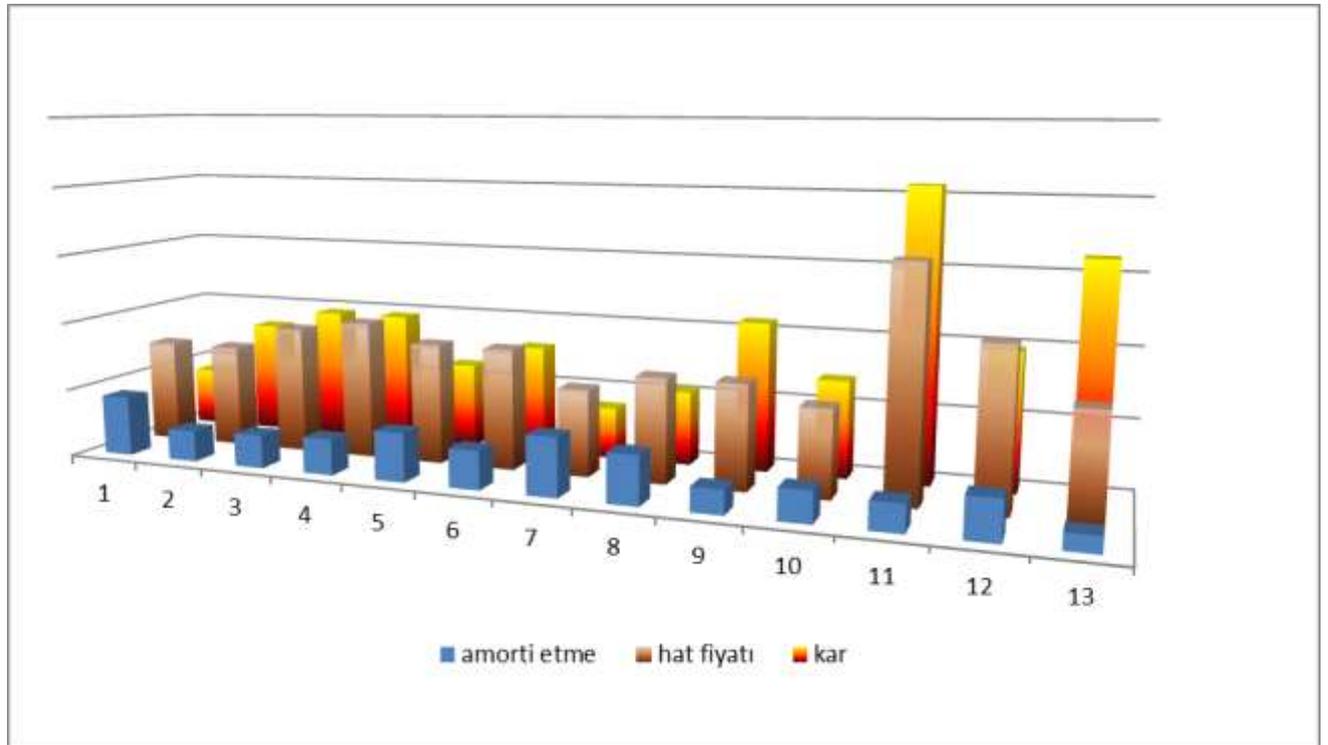


FIGURE 1: Line Price, Profit Of The Line And Amortisation Time At Stations.

6. CONNECTION BETWEEN LINE PRICES AND PASSENGER NUMBERS

We showed that is there any connection line prices and passenger number carrying in a line at below. In accordance with the figure 2, line prices and passenger number carrying in a line are compliant with each other. The more passenger are being carried in a line, the more price of line is higher.

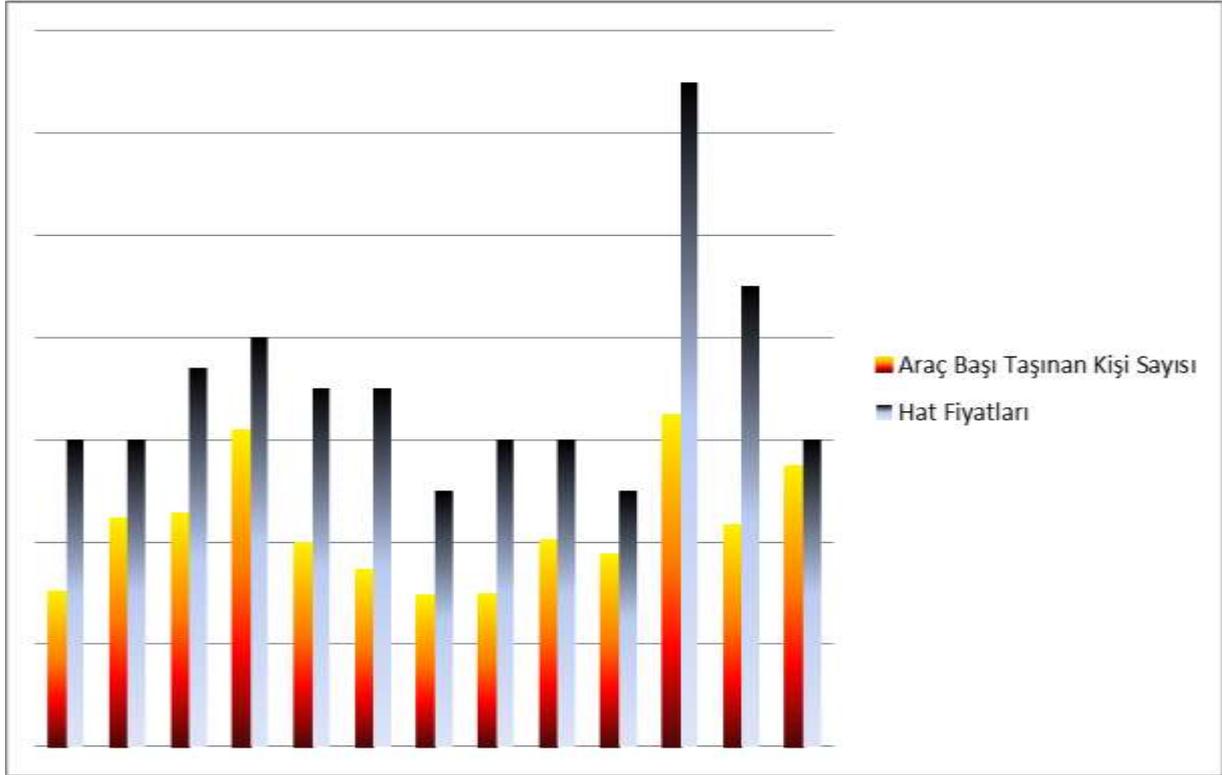


FIGURE 2: Line Prices And Passenger Numbers

7. IS THERE ANY IDLE CAPACITY AT MINIBUS LINES?

In accordance to our calculations, % 35 of minibuses are excessive situation. This means minibuses are working with % 35 idle capacity. There is no need to 145 minibuses at transportation. This means that minibuses have high and unnecessary cost, opportunity cost. The same transportation function may have been given with 145 minibuses.

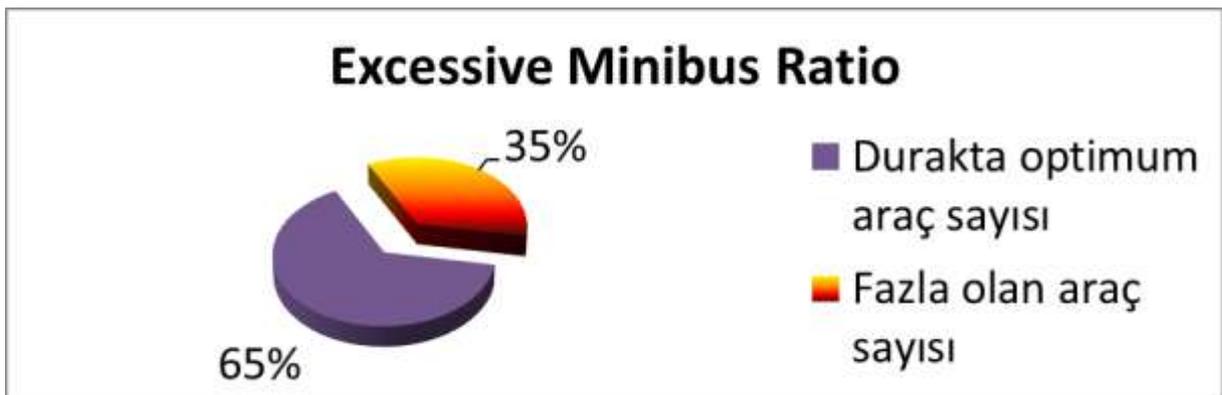


FIGURE 3: Idle Capacity Of Minibus Lines

8.CONNECTION BETWEEN FUEL OIL PRICE AND PROFIT OF THE MINIBUS

Every body knows that there is a strong connection between fuel oil price and profit level of minibuses. In Turkey, oil prices are very high so far as other countries. In accordance to our calculations, fuel oil price is the most important and biggest part of the total cost of minibuses. % 1 increase at fuel oil effects the profit at the proportion of % 0,9 decreasing. Oil price is very unstable in Turkey because of most of the oil imported outside of the country. This reflects to profit level and this level has been changing along the year.

9. ECONOMICAL CONTRIBUTION TO SAKARYA ECONOMY OF MINIBUSES

In accordance to table 3, minibuses directly contribute employment of the 910 persons. These persons constitute of owner and driver of minibus and station civils. If we suppose a family constitutes of 4 person, minibuses in Adapazarı have been contributed total income of 3.640 person.

Total output of the minibuses have been contributed total income of 20.579 persons indirectly. Minibuses have been spent 15.557.452 TL in a month and if this total is divided to living index of a person, total income of 20.579 persons have been contributed by minibuses.

Direct Economical Contribution Of Minibuses	
To Owner	416
To Driver	416
Station Civils	78
Directly Number of Employed Person	910
Directly Number of Income Supported Person (A family = 4 person)	3640
Undirect Economical Contribution Of Minibuses	
Replacement parts, maintenance, restoration	3.297.508 TL
Fuel Oil Cost	12.259.944 TL
Total	15.557.452 TL

Kamu-Sen syndicate living index for one person	3.204 Liras	Turkish
Indirectly Number of Employed Person	5.105	
Indirectly Number of Income Supported Person (A family = 4 person)	20.579	

Table 3: Economical Contribution Of Minibuses To Sakarya City

10. IF 2 MINIBUSES TURNS INTO ONE BUS

In this section, we calculated all important alternatives in case of two minibuses turn into a bus. For this aim, we got specialities of Fiat Ducato minibus and Otokar Doruk 190s bus. In case of 2 Fiat Ducato minibüs turn into 1 Otokar Doruk 190s bus, we determined profit, income and expense for 2 situations as comparative.

First of all, we got all expenses of Fiat Ducato minibus and Otokar Doruk 190s bus for 100.000 km road. These information was taken from seller of these vehicles. These information reflect 2011 numbers. The result of this research is cost of bus surpasses cost of minibus nearly at the proportion of % 60. These information about vehicles are below:

FIAT DUCATO 2,3 Multijet 2011 MINIBUS

Vehicle Maintenance Types	Km	Cost (TL)	Number	Total Cost
Oil Change	20000	350	5,35	1874
Alternator Belt Change	60000	300	1,78	535
Trigger Belt Change	120000	1000	0,89	892
Clutch Disc Change	150000	600	0,71	428
Brake Disc Change	40000	250	2,68	669
Motor	400000	13000	0,27	3480
Tyre Change	80000	800	1,34	1071
Gearbox Differential Oil Change	60000	100	1,78	178
Yearly Maintenance Cost				9.128 TL

OTOKAR DORUK 190 S BUS

Vehicle Maintenance Types	Km	Cost(TL)	Number	Total Cost
Oil Change	20000	400	5,02	2010
Alternator Belt Change	40000	118	2,51	296
Trigger Belt Change	40000	151	2,51	379
Climate Belt	70000	65	1,44	93
Clutch Disc Change	120000	758	0,84	635
Brake Disc Change	70000	540	1,44	775
Motor	800000	35000	0,13	4396
Tyre Change	70000	3000	1,44	4307
Ed Blue Addition	2357	40	42,63	1705
Gearbox Differential Oil Change	40000	150	2,51	377
Yearly Maintenance Cost				14.974 TL

TABLE 4: All Expenses Of Fiat Ducato Minibus And Otokar Doruk 190s Bus

Other information of Fiat Ducato minibus are below:

Oil Consume Of FIAT DUCATO 2,3 Multijet 2011 MINIBUS		
Type	Oil Consume (100 km/ lt)	
Inner City	10,5	
Out Of City	7,6	

Capacity and Price Of FIAT DUCATO 2,3 Multijet 2011 MINIBUS	
Chair	14
Standing	3
Selling Price	65.800 TL

TABLE 5: Oil Consume, Price And Capacity Of Fiat Ducato Minibus

Yearly Maintenance and Other Costs			
1	Auto Insurance	1600	Yearly
2	Obliged Insurance	350	Yearly
3	Auto Tax	265	½ Year
4	Emission Tax	20	Yearly
5	Examination	150	Yearly
6	Line Hire	1000	Yearly
7	Driver Salary	1250	Yearly
8	Other Fees	159	Yearly
9	Bağkur	350	Yearly
10	Visa	16	Yearly
11	Station Costs	250	Yearly

TABLE 6: Yearly Maintenance And Other Costs Of Fiat Ducato Minibus

Other information of Otokar Doruk 190s Bus are below:

Oil Consume Of OTOKAR DORUK 190 S BUS	
Type	Oil Consume (100 km/ lt)
Inner City	28
Out Of City	22

Capacity	
Chair	35
Standing	25
Selling Price	275.000 TL

TABLE 7: Oil Consume, Price And Capacity Of Otokar Doruk 190s Bus

Yearly Maintenance And Other Costs			
1	Auto Insurance	5400	Yearly
2	Obligated Insurance	1092	Yearly
3	Auto Tax	790	½ Yearly
4	Emission Tax	20	Yearly
5	Examination	200	Yearly
6	Line Hire	1000	Yearly
7	Driver Salary	1250	Yearly
8	Other Fees	159	Yearly
9	Bağkur	350	Yearly
10	Visa	16	Yearly
11	Station Costs	250	Yearly

TABLE 8: Yearly Maintenance And Other Costs Of Otokar Doruk 190s Bus

In accordance to these information, price of bus is 4 times more expensive than other one. Other costs of bus are more than costs of minibüs but, in terms of capacity bus is more advantageus than minibüs.

11. RESULT TABLE OF TURNING TO BUS FROM MINIBUS

So far as our scenario, 2 minibüs will turn into one bus and in case of 5.000 passengers are carried by these vehicle alternatives we determined the probable cost, profit and income results. These are below:

	Bus With Cart54	Bus Without Cart54	Minibus
Passengers (Monthly)	5.000	5.000	5.000
Civil Passengers	3.600	3.600	3.600
Student Passengers	1.400	1.400	1.400
Civil Fee	1,00	1,25	1,25
Student Fee	0,75	0,90	0,90
Free Passengers	4%		
Hire And Charge Of Card 54	8%	8%	1.000
Monthly Income	4.146 TL	5.299 TL	5.677 TL
Loss	1.531 TL	377 TL	- TL

TABLE 9. Comparance Of Profitabilty Of Minibus and Bus

All fees are manually gathered in minibuses. Minibuses are not included to card54 system but fees are piled by card54 system electronically in bus . Fees piled by card54 system are transfered to bank account. Tax is taken over the piled fees and this amount is more higher than tax piled without car54 system. This cost is the most important one in case of turning into bus. The other important cost is card54 system hire taken over income as % 8. Another loss is falling of the fees. Now, Minibuses are taking 1,25 TL from Civil person and 0,9 TL from students as fee. In cart54 system, These fees will fall into 1.00 TL at civil person and 0,75 TL at student. If a person change the vehicle in one hour, the second fee will be with %50 discount.

If all of these situations are taken into account, turning into the bus with card54 system will cause to 1.531 TL loss according to minibus. Loss of being bus is 377 TL without card54 system. High costed components of bus and long amortisation time are taken into account turning into the bus is not advantageous under these circumstances.

12. CONCLUSIONS

When examining cities in Turkey, it is easily recognized that growth trend in urban transportation is becoming more and more unsustainable for minibuses in terms of investments and planning as well as projections. The current conditions are bound to eliminate minibuses as long as they are not given an opportunity to compete on an equal basis and to institutionalize.

According to the projections, expected profit in changing minibuses with larger busses is lesser than likely risks. This situation can be explained by as follows;

- High tax rates after institutionalization and incorporation eliminate advantages of scale economy

- High purchasing and operating costs
- Pricing costs of card pass system
- Costs on free and discount tickets

The balance of income and expense should be sustainable and suitable for the sector in cities where a transformation is planned.

The ratio of Value added taxes (VAT) in Turkey (%18) is relatively higher than that of European counterparts (%0-%8). The VAT ratio should be decreased to the ratio of the European countries.

The fuel bill constitutes an important part of total costs as a result of high special consumption taxes (SCT) in Turkey. The ratio of SCT is relatively higher than that of European counterparts.

Similar incentive activities aiming at investment and personnel as in the sectors of agriculture and public services should be introduced in the private mass transportation.

The bank of Provinces should extend credit with low interest rates and long dated to the private mass transportation to renew the means of transportation under the same conditions with the local administrations.

It should be enabled for the sector to employ professional and qualified staff to improve productivity and quality (Social insurance premiums and tax liabilities should be undertaken by the state).

REFERENCES

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