

# A Study on Operational Efficiency Enhancement of University Transport System with Special Reference to Vignan University, Guntur, Andhra Pradesh

Phani Kumar Katuri\*, K. S. Rao\*\*

*\*Assistant Professor, School of Management Studies, Vignan University, Vadlamudi, Guntur, Andhra Pradesh, India, Email: katuri.phanikumar@gmail.com.C.no*

*\*\*Professor, Department of Commerce & Management Studies, Andhra University, Vishakapatnam, Andhra Pradesh, India, Email: profksrao@rediffmail.com*

## ABSTRACT

The present study focuses on operational efficiency enhancement of university transport system with special reference to Vignan University, Guntur. Vignan University was established in the year of 2008 in remote village named Vadlamudi. The university gets the students from nearer towns. For providing better facilities to the student's community, university started transport system and it have not been going on smoothly. University management is not satisfied with the performance of transport wing in terms of profits and operational efficiency. This study is intended to examine the operational costs and optimal bus facility network allocation. For this study, data are collected from both primary and secondary sources. Data are analysed on the basis of cost-benefit analysis. The results revealed that variations taken place in operating costs, transit operations could save better to management by reallocate resources as per operational cost changes. Transit network setting is one of the causes for incurring high costs. The data analysis reveals that there is a scope for increasing the profits by operational efficiency enhancement. Findings and suggestions of this study may be helpful to the university policy makers for developing more effective and better transport system.

**Keywords:** Operational Efficiency, Transport System, Optimum Net Work, Revenue, Maintenance Cost

## INTRODUCTION

Vignan Group is a premier group of institutions in the country, which has established a strong foothold at all levels of education by catering to the needs of various sections of student community. Starting from schools to junior colleges (+2), science, engineering, pharmacy, and postgraduate institutions with a student base of about 40,000, Vignan has today branched across all important geographical areas of A.P., like Guntur, Vijayawada, Eluru, Rajahmundry, Charla, Vishakapatnam, and Hyderabad. Vignan Transport (VT) Guntur branch is operating total 43 buses. Out of these 11 buses are new and having 60 seats capacity and another 16 are new mini buses of 41 seating capacity. The transport department also operates 2 mini buses (Swaraj Mazda make) of 42 seats capacity and 13 old buses of 55 seats capacity. Among these 14 buses are used for transportation of students and staff of LIC School out of which 10 buses are used for 2<sup>nd</sup> shift operation to Vadlamudi. Four buses

are used by Palakaluru School and out of this 3 buses are used for 2<sup>nd</sup> shift operation to Nirula Engineering College. Three buses are used for Junior college and 1st shift operation to Vadlamudi. Balance 25 buses are used for transportation of students and staff to Vignan University in the 1<sup>st</sup> shift. Seventeen buses are operated to Vignan Lara and Vignan Pharmacy College at Vadlamudi to 2<sup>nd</sup> shift. Vignan transportation is catering to the needs of about 1733 students and 282 staff members, travelling from various locations like Guntur, Vijayawada, and Tenali to Vadlamudi campus. It also has 1255 bus users for LIC and Palakaluru campuses. The total revenue and expenditure for the academic year 2012-13 is Rs. 2, 71, 01, 136 and Rs. 1, 87, 25, 390 respectively. A saving of even 2% will result to Rs. 3, 70,000 revenue increase. The present operation of Vignan transport is satisfactory but still there is a scope for further improvement of operational efficiency. In this context a study is initiated to know about the present system of operation and to offer suggestions for improvement.

## OBJECTIVES

1. To study vehicle wise present mileage (kmpl), scheduling of the buses, maintenance cost, and to find out the reasons for abnormalities in some of the vehicles.
2. To analyse the present method of preventive and breakdown maintenance system and to propose better method.
3. To find out the financial feasibility of existing and extended routes.
4. To study the present bus fee structure and increase in diesel price in this academic year and to propose fee for next academic year.
5. To know the reasons for unauthorised travelling and overloading of students and feasibility of introducing buses in new routes like Bapatla, Narasaraopeta, Satenapalli, and Repalle.
6. To suggest the incentive schemes for drivers for better mileage (kmpl), maintenance of vehicle and accident free driving.

## METHODOLOGY

- ◆ The data are collected from primary and secondary sources and analysed.
- ◆ Primary sources: By discussing with G. M., maintenance and scheduling in-charges and accountant of Vignan transport.
- ◆ Secondary source: By collecting the data from maintenance and accounts books of VT.

## REVIEW OF LITERATURE

In their paper, Swamy and Ogra (2012) discuss Integrated Transit Management System (ITMS) for the city of Ahmedabad. ITMS is one of instruments targeted to meet the corporate objectives of enhancing service standards through commuter market approaches, enhanced organisation of planning and operations management, transit integration of functions, and improved revenue management systems. Based on the initial results, the paper discusses the components of the ITMS with an aim to providing world class transit experience. The paper also discusses the contribution of the ITMS to service delivery, management of operations both technical and financial and in decision support both in terms of operations and in defining a variety of policy and investment interventions.

A global literature review on the effect of bus O & M practices on fuel economy reveals limited documentation, but offers examples of areas for improvement. A study from Singapore tracking the daily fuel economy of 24 buses over 3 months found that major maintenance—recommended servicing every 30,000 km—increased fuel economy by 3.2 percent (Ang & Deng, 1990). Another significant finding was that the effects of maintenance decline with mileage accumulation after major service. In another study, nine bus companies in Jakarta participated in a comprehensive bus inspection/maintenance (I/M) and driver training programme (UNEP, 2009). While a 5 percent decrease in fuel consumption was achieved through maintenance practices, improved driving methods resulted in another 10 percent decrease in fuel consumption.

Similarly, the Andhra Pradesh State Road Transport Corporation (APSRTC) in India reported fuel economy for identical bus types in Hyderabad to be 10 to 12 percent higher than the values reported by Mumbai and Delhi (Sudhakararao, 2010). Although there are differences in route congestion and weather conditions between these cities, much of the fuel economy benefits are attribute able to bus O&M practices already in place. APSRTC has a long-standing programme on O&M practices to improve city-wide bus fleet fuel economy.

Data over 29 years (1980-2009) show that fuel economy has improved from 4.1 km per liter (km/L) in 1981 to 5.2 km/L in 2010-11 (APSRTC, 2010). Comparable buses in Delhi Transport Corporation (DTC) and Brihan Mumbai Electric Supply and Transport (BEST) report fuel efficiencies in the 4.2 to 4.5 km/L range (ESMAP, 2011).

On the other hand, minor malfunctions in the air/fuel or spark management systems can increase fuel consumption and emissions significantly. A study conducted in Bangkok shows, with over 90 percent of all public transport handled bybuses, that a periodic maintenance programme for aging bus fleet resulted in a fuel economy gain of 9 percent and a significant drop in exhaust emissions—by at least 40 percent carbon monoxide, 20 percent hydrocarbons, 55 percent particulate matter, 15 percent black smoke, and 27 percent opacity.

Driving practices have been recognised as a key factor in enabling buses to obtain good fuel economy. Driver training programmes, teaching drivers how to drive in a fuel-efficient and safe manner, have been developed in many countries and share common content. A key finding is that the benefits are obtained not through classroom instruction but from actual on-road training with a

professional driving instructor. Driver training for safe and fuel-efficient driving was uniformly provided in the countries surveyed, and is a legal requirement in many countries.

The literature on bus maintenance practices has been summarised in meta studies conducted by the US Transportation Research Board (Schiavone, 2005).

## DATA ANALYSIS

### High Maintenance Cost and Low kmpl Vehicles

Information of high maintenance cost incurring vehicles and reasons are collected and presented in Table 1.

*Make:* SM-Swaraj Mazda, T-Tata, Ley- Ashok Leyland

The vehicles like AP07 TU5996, AP07TW1618, AP07TW7187,7128, and 7132 are less than six years

model but more maintenance cost ranging from Rs. 56000-78000 was noticed. The common reasons for more maintenance cost found in these vehicles are battery and clutch springer replacement. The reasons for the replacement may be improper maintenance of battery and clutch utilisation by some drivers. Hence it is suggested to train the drivers in proper maintenance of batteries and clutch utilisation techniques.

The reasons for low mileage are to be taken into consideration. The steps like in-time maintenance of vehicles, training and counseling to drivers of low kmpl vehicle are to be taken.

### Present Preventive Measures

Changing of engine oil for every 36,000 kms or once in a year whichever comes earlier: Normally V.T. is conducting this activity in Jan/Dec every year.

**Table 1: Vehicles with High Maintenance Cost and Reasons for the Same**

S.No.	Vehicle No.	Seating capacity	Year of manufacturing	Make	Net Maint. Cost(Rs)	Reasons for high maintenance Cost
1	AP07TU5996	42	2007	SM	74227	Body work, pillar replacement and battery replacement
2	AP07TU5997	42	2007	SM	47354	Clutch springer, clutch plate, battery and side glass were replaced.
3	AP07TW2515	41	2008	T	37104	Clutch springer, clutch plate, battery and side glass were replaced.
4	AP28Y9040	41	2008	T	34230	Transferred from Hyderabad. Clutch springer, clutch plate, battery and side glass were replaced, seat replacement
5	AP07TU861	50	1995	Ley	47982	Old vehicles to be scraped as per GO
6	AP07TU859	50	1998	Ley	37000	Old vehicles to be scraped as per GO
7	AP07TU860	50	1998	Ley	41621	Old vehicles to be scraped as per GO
8	AP16W6299	56	1998	Ley	49026	Old vehicles to be scraped as per GO
9	AP07X648	51	2000	Ley	54786	Clutch springer, clutch plate and injector, and side glass were replaced. seat work was done
10	AP16X3349	51	2000	Ley	52703	Battery and break down replacement was done along with seat work.
11	AP31V9786	48	2000	Ley	32056	Seat cloths and battery replacement.
12	AP07X216	51	2000	Ley	42860	Side glass, battery were replaced and seat work was done.
13	AP16X7157	56	2001	Ley	38381	Clutch plate, springer and battery replacement
14	AP16X6145	56	2001	Ley	43802	Battery replacement and body work
15	AP35T7229	56	2003	Ley	69098	This was transferred from Vizag. Gearbox, clutch and propeller shaft were replaced.
16	AP07TW1618	56	2008	Tata	78070	Clutch, springer, break item and seats were replaced
17	AP07TW7187	62	2009	Ley	75348	Battery replacement, electric spares, wiring and lights were replaced.
18	AP07TW7128	62	2009	Ley	56188	Battery replacement and other repairs
19	AP07TW7132	62	2009	Ley	59038	Battery and seat rexin cloth replacement
		<b>Total</b>			<b>880227</b>	

**Table 2: Details of Low kmpl Vehicles with Reasons**

S.No.	Vehicle No.	Year of Manufacture	Make	Avg.kmpl	Reasons for low mileage
1	AP28Y9040	2008	Tata	6.38	The vehicle was transferred from Hyderabad during June 2012 and low kmpl was identified during the first 4 months. Repairing was carried on the clutch springer, and battery replaced. Side glass replacement and seat work was carried. At present mileage was improved to 6.83kmpl
2	AP07TW2515	2008	Tata	6.65	Operating in rural area and these roads are in bad condition, hence low mileage was observed.
3	AP07TC5016	2012	Tata	6.52	It was brought to the notice of Jaspheer Motors, Guntur. Now the kmpl is improved 6.65 against the same model vehicle AP07TC 5018 is giving 7.27kmpl
4	AP07TU5997	2007	Swaraj Mazda	5.43	Engine top overall work is to be carried out to improve the mileage.
5	AP07X648	2000	Ley	3.74	Fuel injection pump is to be replaced and driving style of driver to be improved (Driver Mr. Lokeswara Rao)
6	AP16X7157	2001	Ley	4.24	Bad road conditions
7	AP07TW7187	2009	Ley	4.79	Driving habits of the driver to be improved (Driver Mr. Anjaneyulu, Vijayawada bus)

F.C. work: Seat work, glass, body colour work is done yearly once in the month of May during fitness certification (FC) work.

Four wheels' grease change is carried out for every 48000 km or once yearly.

Chassis grease is applied once in 15 days.

Battery maintenance is done once in 15 days and is done by V.T. mechanic.

Tyre pressure is checked by the driver everyday and by V.T. mechanic once in 15 days.

Daily checkup work like engine oil, water level, tyre pressure is to be carried by the driver.

Every driver is advised to appraise the condition of the vehicle on weekly basis to maintenance supervisor in order to rectify the same.

Tyre disc rotation is to be done once in 3 months or 10,000km in order to have equal wear out of surface level of the Tyre.

V.T. mechanic is advised to apply petrol gel once in fortnight on the battery terminal in order to prevent the damage.

The water level in the batteries is to be checked once every fortnight.

V.T. mechanic is working 4 days at Vadlamudi and 2 days at LIC.

Clutch, fuel injection pump problems are to be identified at the early stage and to be repaired immediately. The drivers with low mileage are counseled and training is provided.

### Proposed Guidelines for Preventive Maintenance

Daily, weekly, and fortnightly checklists are to be prepared and circulated to the drivers.

Quarterly vehicle maintenance awareness camp should be conducted for the drivers for proper maintenance of vehicle.

The scheduling in-charge is advised to check whether the preventive maintenance measures are followed properly or not and requested to report it to GM transport.

### Present Maintenance Procedure for Breakdown Maintenance

First breakdown maintenance will be normally attempted by V.T. mechanic. In case of major problems like engine, gear box, transmission mechanism repairing where equipment is not available with V.T. mechanic, the work is to be carried out at the outside workshop. The balance minor repair work can be carried out by our mechanic.

It is advised to consult the expert mechanic whenever the low kmpl and abnormalities are observed in the vehicle.

### Non-Feasible Route Identified for Schools, Jr. and Engineering Colleges

The extended routes mentioned under serial No. 1, 6 are to be cancelled immediately, because V.T. is unable to recover even the Diesel expenditure.

By cancelling out the route extension of school buses, we can use the vehicle for single shift operation to Vadlamudi where the revenue generation is more.

Only Medikonduru route of Jr. College is feasible to operate with a margin of Rs.3,75,863. If we consider maintenance cost of vehicles in non-feasible extended routes, all vehicles in these routes make operational

losses. Hence it is advised to school principles to cancel the extended routes by informing well in advance to the students' parents.

In the 2<sup>nd</sup> shift of Ponnuru route only 8 members of Lara and pharmacy are travelling by operating 46 km/day. Hence we may think of cancelling the bus for 2<sup>nd</sup> shift.

### Fee Structure and Diesel Price

Total oil price increase per liter in the academic year 2012-1 is Rs. 8.08.

In the last academic year the Diesel price was raised by 18%. We may increase the bus fee for next academic year

**Table 3: Non-Feasible Routes Identified for the LIC School**

S.No	Name of the village	Name of the preceding village	Additional km required to travel	No. of students travelling	Total amount collected	Additional km travelled in academic year	Additional expenditure on diesel /yr	Net profit or loss due to extension
1	Namburu	Kakani	24	10	60000	6000	75000	-15000
2	S. J.Mudi	Vad. X' road	8	7	42000	2000	22222	19778
3	Kr. Palem	Chebrolu	6	9	52200	1500	16667	35533
4	Godavarru	Narakoduru	8	9	52200	2000	22222	29978
5	Muttluru	Vatticherukuru	8	9	54000	2000	23585	30415
6	Katrapadu	Vinjanampadu	8	2	10600	2000	22624	-12024
7	Ch.Mudi	Vinjanampadu	4	3	15900	1000	11312	4588
8	Kondepudu	Koyavaripalem	8	13	78000	2000	21277	56723
9	N.Nagar	Gorantla	8	9	38700	2000	15674	23026

**Table 4: Non-Feasible Routes Identified for the Palakaluru School**

S.No	Name of the village	Name of the preceding village	Additional km required to travel	No. of students travelling	Total amount paid	Additional km travelled in academic year	Additional expenditure on diesel /yr	Net profit or loss due to extension
1	Siripuram	Medikonduru	18	12	63600	4500	50905	12695
2	Mandapadu	Bandarupalli	10	9	45900	2500	16667	29233

**Table 5: Non-Feasible Routes Identified for the Jr. College**

S.No	Name of the village	Total km required to travel	No. of students travelling	Total amount paid	Total no. of kms	expenditure on diesel /yr	Net profit or loss due to extension
1	Uppalapadu	46	12	96000	13800	88462	59538
	Garapadu	40	4	28000			
	Kottapeta	12	4	24000			
				148000			
2	Narakoduru	38	12	84000	11400	76716	55284
	Sangadigunta	12	8	48000			
				132000			

**Table 6: Present Bus Fee Structure of Vehicle Operated to Vadlamudi Campus**

S.No	Name of the route	Bus fee	No. of km travelled
1	Guntur	10500	48
2	Tenali	7800	28
3	Vijayawada	19000(including tollfee)	68
4	Ponnuru	10500	46
5	Mangalagiri	15500	47

**Table 7: Diesel Price Increase from April 2012-March 2013**

S.No	Month	Price	Difference	Change of price date
1	April-2012	44.73	44.73	Nil
2	May	44.73	44.73	Nil
3	Jun	44.73	44.730	Nil
4	July	44.73	-0.17	26-7-2012
5	Aug	44.73	0.14	Nil
6	Sep	50.98	6.11	14-9-2012
7	Oct	51.16	0.18	28-10-2012
8	Nov	51.16	51.16	Nil
9	Dec	51.16	51.16	Nil
10	Jan-2013	51.71	0.55	16-1-2013
11	Feb	52.26	0.55	16-2-2013
12	Mar	52.81	0.55	16-3-2013

**Table 8: Proposed New Schedule**

Starting Place	Actual Strength	Available Seating Capacity	Shortage (S)/ Excess(E) Seats	Bus Starting Time (AM)	Remarks
Guntur	786	720 (9BB+6SB)	66(S)	7:30	One bus to transfer from Hyderabad Women's Engg. College To Guntur
Tenali	215	176 (1BB+4SB)	39(S)	7:25	One small bus to cancel from Mangalagiri and to start from Tenali
Ponnur	38	40 (1SB)	2(E)	7:15	----
Mangalagiri (1SB Via Revendra -padu)	53	40 (1SB)	13(S)	7:10	Shortage of 13 seats can be met by considering 7% absenteeism of Vijayawada 2-route buses and to pickup students from Mangalagiri bypass and to Travel Via Nagarjuna University
Vijayawada	186	183 (3BB)	3(S)	6:20	----

by 15%, by keeping in view of future monthly increase in Diesel price Rs. 0.5/ liter. More over the APSRTC is also proposed to increase the student bus pass charges by 50%.

The cross subsidisation for schools and junior colleges are increasing. In order to reduce this, it is advised to increase bus fee for these institutes by 30%.

### Proposed New Schedule

After studying the present method of scheduling the new schedule was proposed by project guide from 31/1/13.

BB- Big bus, SB- Small bus, S- Shortage and E- Excess

The new schedule was resulted in the cancellation of one small bus from Mangalagiri. The cancelled bus was scheduled from Tenali and resulted into savings of travelling distance 62 km per day. The rescheduling of vehicle resulted into total Diesel saving of 2215 liters and other maintenance expenditure to the tune of Rs. 2,00,000 without causing any problems to the students. This suggestion was already implemented by V.T. from 1/2/2013

### Suggestion for New Buses

By considering 10% increase in student strength for the next academic year, suggested to the management for the purchase of total 10 new buses (i.e., 5 buses to replace the old vehicles, 3 buses to take care about the proposed increase in strength and additional 2 buses to operate in a

single shift to Vadlamudi)

The details of arriving 10 Buses are mentioned below:

In the present academic year, the total no. of students using Vignan Transport buses to reach Vadlamudi Campus is 2010. The breakup is as follows.

**Table 9: Students Using Vignan Transport Buses to Reach Vadlamudi Campus**

S. No.	Name of the Town	Vignan University	Lara + Pharmacy	Total
1	Guntur	786	482	1278
2	Vijayawada	186	29	215
3	Tenali	215	185	400
4	Mangalagiri	53	18	71
5	Ponnur	38	8	46
	<b>Total</b>	<b>1278</b>	<b>732</b>	<b>2010</b>

Expected total strength of students that are going to use V.T. buses to reach Vadlamudi campus for the academic year 2013-2014

= Present Strength + Expected increase in strength by considering 12% increase over previous year = 2010 + 240 = 2250

There will be shortage of 240 seats, if we want to run all Vadlamudi-based institutions in a single shift. The detailed break up is as follows.

The present no. of buses (43) and seats available at present = 2149

Less - No. of seats non available due to 15 years of age and due for replacement = 260

Less - 4 small buses are not available due to second shift utilisation for Nirula = 200

Less - 3 small buses are to be transferred to Ongole schools as per the

instruction of Vice-Chairman = 120

Total Net Availability of Seats for the Next Academic Year = 1569

Total Net Shortage of Seats for the Next Academic Year = 2250 - 1569 = 681

Permission already sanctioned for purchase of 6 large buses with total seating capacity of 360.

By considering this, the net additional requirement of seats = 681 - 360 = 321.

Even at 75% of estimation, the requirement will be for 240 seats or 4 large buses.

Hence, we requested the management to think of going for 4 more large buses with a seating capacity of 60, latest by 15-05-2013.

This suggestion was already considered by the management and purchased the new vehicles.

### Feasibility Study Report on Proposed Bus Routes

The feasibility study for introduction of buses from the next academic year from Bapatla, Chilakaluripet, Narasaraopet, Repalle, and Sattenaplli was carried by the guide and Mr. Uma Maheswara Rao.

The details of existing students studying in various Vignan Institutions at Vadlamudi are given in Table 10.

- The fuel expenditure is calculated based on the distance. The other expenditure per year includes driver salary, insurance, interest charges, maintenance cost and tax etc. The EMI is not included while arriving at the total expenditure per year per bus.
- When compared to RTC bus charges (by considering students concession) our VT bus charges are going to be on the higher side. The journey time is more, hence one bus will be used for one trip only as we are operating to Vijayawada.
- Seven small buses with 40 seats capacity may be sufficient to introduce busses initially in these routes. The existing one bus to Ponnur can be extended to Bapatla. Hence one more bus may be sufficient by clubbing Ponnur and Bapatla route for optimum utilisation of buses.
- The Repalle route may not be viable to operate due to the high operational expenditure and the journey time involved. Moreover the Repalle town is connected from Tenali by train. The train journey takes less time and monthly pass cost is also very cheap. Hence the students may not be interested to travel in VT buses.
- Under the above conditions if we are able to provide bus service to the students on cost to cost

**Table 10: Existing Students Studying in Various Vignan Institutions at Vadlamudi**

Name of the Town	Distance from Vadla-mudi in KMs	No. of Students Studying in Vignan University					VLITS	Vignan Pharmacy	Grand Total
		I Year	II Year	III Year	IV Year	Total			
Bapatla	46	04	05	02	14	25	-	-	25
Chilakaluripet Via (Edlapadu)	56	10	08	06	14	38+06=44	08	01	44+9 = 53
Narasaraopeta via (Phirangipuram)	70	11	10	10	09	40+06=46	07	02	46+ 9 = 55
Sattenapalle via (Medikonduru)	50	09	12	07	04	32+14=46	03+02=05	05	46 + 10 = 56
Repalle	73	16	16	15	08	55	04	04	55+8=63

**Table 11: Operational Expenses and Proposed Bus Fee for various Towns**

Name of the Town	To and From Distance (Kms)	Expected fuel expenditure per year (Rs.)	Other maintenance expenditure per year (Rs.)	Total expenditure per year (Rs.)	Proposed fee structure by considering 100% occupancy (Rs.)	Proposed fee structure by considering 70% occupancy (Rs.)	To and From expected time of journey
Bapatla	92	3,24,000	1,70,000	4,94,000	12,350/-	17,650/-	2 hrs 30 minutes
Chilakaluripet (Edlapadu)	112	4,03,200	1,70,000	5,73,200	14,350/-	20,500/-	2 hrs 40 minutes
Narasaropet (Phirangipuram)	140	5,04,000	1,70,000	6,74,000	16,850/-	24,000/-	3 hrs 30 minutes
Sattenapalle (Medikonduru)	104	3,74,400	1,70,000	5,44,400	13,600/-	19,500/-	3 hrs
Repalle	146	5,25,600	1,70,000	6,95,600	17,400/-	25,000/-	4 hrs

basis or by providing subsidy in case of 70% or less occupancy the operation may be feasible. However, we may think of introducing buses to all four routes except Repalle town from the next academic year. The introduction of buses on these routes may increase the admissions to VU and attracting to better students to VLITS and Vignan Pharmacy.

The feasibility study report was already submitted to the chairman.

### Incentive Schemes to the Drivers

Incentive schemes to the drivers for better kmpl, better up keeping of vehicle and accident free driving are to be introduced.

### Software Requirements

In order to avoid unauthorised travelling and overloading of students in VT buses we explained the requirements to software developers Mr. Sai Kiran and Mr. Srinivas. They are in the process of modifying the software in order to produce the list of students boarding VT buses-stop, college, branch and year wise. We requested them to complete the modifications by 31<sup>st</sup> May 2013. This measure will avoid unauthorised travelling and overloading of students in VT buses.

### FINDINGS

1. According to recent GO of Govt. of AP the vehicles which are having more than 15 years of age need to be replaced. Hence vehicle No. AP07TU859,

**Table 11: Revenue and Expenditure Statement of VT for the Academic Year 2012-13**

The revenue of Vignan Transport Guntur for the academic year 2012-13		
S.No.	College/School name	Amount(Rs)
1	Bus fee VU	11840950
2	Bus fee Lara	5310900
3	Bus fee Pharmacy	953000
4	Nirula College	817100
5	Degree college	15000
6	Junior college	708000
7	LIC school	4017000
8	PKLR school	1054500
	<b>Total</b>	<b>24716450</b>
1	Staff bus fee VU	1048904
2	Staff bus fee Lara	452278
3	Staff bus fee Pharmacy	47755
	<b>Total</b>	<b>1548937</b>
1	Other income	647448
2	Interest received	156866
3	Misc. income	31435
	<b>Total</b>	<b>835749</b>
	<b>Total Revenue</b>	<b>27101136</b>
The expenditure Vignan Transport Guntur for the academic year 2012-13		
1	Insurance , road, tax, and vehicle maintenance	4477470
2	Salaries	5262856
3	Diesel	8127284
4	other expenses	857780
		<b>18725390</b>
	<b>Net Profit before EMI</b>	<b>8375746</b>
	EMI paid in the academic year	<b>941360</b>
	<b>Net operational Profit after EMI</b>	<b>7434386</b>

AP07TU860, AP07TU 861, AP70 7093, and AP16W6299 need to be replaced.

- Operations in extended routes like Namburu to Kakani, and Katrapadu to Vinjanampadu and Mutluru (bad road conditions and only 9 students are travelling) need to be cancelled.
- Among the 40 seats capacity vehicles, the vehicle-no.AP07TW2515 is giving low mileage of 6.65 kmpl. The reason for low kmplis due to its operation in rural area.
- Among the 40 seats capacity Vehicle No AP07TU5997 is having the mileage 5.43kmpl

against avgkmpl6.65, the reason for the kmpl is to engine top overall work is to be carried out to improve the mileage.

- The vehicle no. AP28Y9040 having mileage of 6.38 kmpl. This vehicle was transferred from Hyderabad during June2012. The low kmpl was identified during the first 4 months. Hence repairs like clutch springer, clutch, battery, side glass replacement, and seat work were carried on this vehicle with Rs.34,230. With these repairs the mileage is improved to 6.83kmpl.
- Among 50 seats capacity vehicles, the vehicle no. AP07X648 is having low mileage of 3.47 kmpl

against the 4.7kmpl of same model vehicles. The reasons for low mileage are identified like fuel injection pump needs to be replaced and driving style of driver needs to be improved.

7. Among the 56 seats capacity vehicles, the vehicle no. AP16X 7157 is having low mileage 4.24 kmpl against 5.4 kmpl of same model vehicle. The reason for low mileage is due to bad road conditions.
8. Among the 60 seats capacity vehicles, the vehicle no. AP07TW 7187 having the low mileage 4.79 kmpl against the 5 kmpl of same model vehicle. The reason for this is driving habits of driver.
9. Quarterly drivers counseling and training is to be given by the expert for achieving better kmpl and maintenance.
10. Non-judicious extension of routes of school buses without checking road condition and no. of students expected to travel, result into more maintenance cost and operational losses.
11. The bus fee for students of school buses is fixed at 50 to 55% to that of VU buses. The bus fee for school buses is to be rationalised by considering the distance travelled and road condition.

## SUGGESTIONS

If V.T. can implement the suggestions mentioned in the report, it can save yearly Rs. 7, 49,000. The summary of suggestions is as follows:

1. By properly scheduling the buses, the V.T. is able to save the Rs. 2, 00,000/year by cancelling 2<sup>nd</sup> shift small bus from Mangalagiri and to readjust this bus to Tenali.
2. By increasing mileage of 7 low kmpl vehicles with better maintenance and driving practice we can save Rs.1, 50,000 on diesel cost alone.
3. The present maintenance cost spent on the selected vehicles is approximately coming to Rs. 8,80,227 as mentioned in Table1. By properly following the preventive maintenance, we can save a minimum of 25% on high maintenance cost incurring vehicles, this amounts to a saving of Rs. 2,20,000
4. V.T. can save Rs. 1,80,000 per year, by cancelling the extended non-feasible routes as mentioned earlier.
5. Only 8 students are travelling on Ponnuru route during 2<sup>nd</sup> shift. Hence by cancelling this bus for 2<sup>nd</sup> shift, V.T. can save Rs. 87,000.
6. By cancelling the extended routes like Siripuram, Mandapadu we can prevent a loss Rs. 42,000 to Palakaluru school buses. By cancelling extension of buses in Namburu, Katrapadu, and Mutluru route we can save approximately Rs. 50,000 per year.  
Total saving by cancelling non-feasible extended routes and Ponnuru bus for 2<sup>nd</sup> shift operation =Rs. 1,79,000
7. Total estimated saving = Rs. 2,00,000+1,50,000+2,20,000+1,79,000 = Rs. 7,49,000
8. The other non-monetary benefits like buses can be used for single shift operation to Vadlamidi is possible (17).

## CONCLUSION

The university needs to focus on various aspects of transport system which will have an impact on policymakers commitment and operational efficiency. Fuel prices, labour problems, and road accidents are of greater concern as it affects quality and profitability of transport system. Based on the study it can be concluded that operational efficiency levels significantly depends on cost-benefit retention practices adopted by the university. Hence it is imperative that Vignam Transport has to accord priority to adopt attractive practices that will in turn lead to better quality and profits. The above changes provided an opportunity to explore the factors which influence operational costs, network design and redesign decisions. There is further scope to improve operational efficiency by conducting workshops to drivers and cleaners about the maintenance and laid a control on fuel prices.

## REFERENCES

- Ang, B. W., & Deng, C. C. (1990). The effects of maintenance on the fuel efficiency of public buses. *Journal of Energy*, March 1990.
- Andhra Pradesh State Road Transportation Corporation (APSRTC). (2010). *City Bus Fleet Maintenance Program to Improve Fuel Efficiency*. Andhra Pradesh State Road Transport Corporation, Hyderabad, India.
- Borndörfer R., & Pfetsch, M. E. (2006). Routing in line planning for public transportation. In: *Operations research proceedings 2005*. Springer, Berlin, pp 405–410

- Borndörfer, R., Grötschel, M., & Pfetsch, M. E. (2005). A path-based model for line planning in public transport. Technical Report 05-18, ZIP Berlin. Published as 'A column generation approach to line planning in public transport', in *Trans Science*, 41, 123-132
- Ceder, A., & Wilson, N. H. M. (1986). Bus network design. *Transp Res B*, 20(4), 331-344.
- Claessens, M. T., van Dijk, N. M., & Zwaneveld, P. J. (1998). Cost optimal allocation of rail passenger lines. *European Journal of Operational Research*, 110, 474-489
- Energy Sector Management Assistance Program (ESMAP). (2011). Transit Bus Operational and Maintenance Practices to Maximize Fuel Economy. Prepared by ICF International, Washington DC, USA, for the Energy Sector Management Assistance Program (Report No. 63116-GLB). The World Bank, Washington, DC.
- International Energy Agency (IEA). (2002). Bus Systems for the Future-Achieving Sustainable Transport Worldwide. International Energy Agency, Paris, 2006. World Energy Outlook 2006.
- International Energy Agency, Paris, France. Iles, R. (2005). *Public Transport in Developing Countries*. Elsevier Ltd., Oxford, UK.
- Intergovernmental Panel on Climate Change (IPCC). (2007). Chapter 5: Transport and its Infrastructure." In *Climate Change 2007: Working Group III: Mitigation of Climate Change*. Intergovernmental Panel on Climate Change Fourth Assessment Report: Climate Change 2007.
- Jacobes, G. D., Maunder, D. A. C., & Fouracre, P. R. (1981). *A comparison of bus operations in cities of developed and developing countries*. Transport and Road Research Laboratory, Crowthorne, Berkshire, UK.
- Kojima, M. (2001). Breathing Clean: Considering the Switch to Natural Gas Buses. World Bank Technical Paper No. 516.
- Prindle, W. R. (2010). From Shop Floor to Top Floor-Best Business Practices on Energy Efficiency. Prepared for the Pew Center on Global Climate Change.
- Pucher, J., Korattyswaroopam, N., & Ittyerah, N. (2004). The crisis of public transport in India: Overwhelming Needs but Limited Resources. *Journal of Public Transportation*, 7(4).
- Schiavone, J. (2005). A guidebook for developing and sharing transit bus maintenance practices. Transit Cooperative Research Program (TCRP) Report No. 109. Transport Research Board of the National Academies, Washington, DC.
- Sudhakararao, U. (2010). *City Bus Operations-Fuel Management*. APSRTC Presentation provided to World Bank, Washington DC. September 2010.
- Transport Canada. (2004). Urban transportation showcase program. *Fuel Sense: Making Fleet and Transit Operations More Efficient*, Case Study No. 24.