



Feasibility study of conversion LTI TX4 to natural gas

Feasibility study has been made with support of MADEGASCAR project



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Attachment

Excel file with analysis of economical feasibility conversion to natural gas



1. Introduction

Wawa Taxi is domiciled in Mińska 69 Street, Praga Południe district, Warsaw. It is so far the only taxi fleet in Warsaw and in Poland which use natural gas. Wawa Taxi has been present on the market for 15 years in Warsaw, for some 4 years it has been using CNG vehicles – Seat Altea and Seat Altea XL. Total number of vehicles driven under Wawa Taxi brand are 500, now 160 cars are fueled by CNG. Wawa Taxi buys 3-4 CNG taxi cars every 2 weeks. Another option for taxi drivers is to buy their own vehicle instead driving Wawa Taxi ones. In the future the company is planning to buy solely cars fueled by CNG, however it is not possible now because of insufficient number of natural gas stations. All Seats in operation are dual-fuel cars: natural gas-petrol.

The further development of NGV's in Warsaw is hindered by the insufficient number of natural gas filling stations. At least 2 new stations, located in different areas of the city would be enough to raise interest in this technology in both private consumers and fleets. The only one gas filling station in Warsaw is located at Kasprzaka Street owned by PGNiG. The station is located in the center of Warsaw - disadvantageous is difficult access due to traffic jams, but cars coming from all uptown areas can be fueled, which is an advantage. Cooperation of PGNiG and Institute for Renewable Energy has brought results. PGNiG decided to built second gas filling station which will have 6 fast fuelling points (comparing to 2 fast fuelling points in existing station).

Wawa taxi success with natural gas field is widely known in Poland, thankful to Institute for Renewable Energy and MADEGASCAR project . Owner of Wawa Taxi wants to replace all taxi cabs, therefore Institute performed analysis of economical profitability for another make of car - LTI TX4.

2 Specification of LTI

The car has 50 years history in Great Britain as is known as “London cab”. The car is exclusively designed as for taxi drivers. It can ferry up to 6 people (1 driver and 5 passengers). It is very roomy and adapted for disabled person. People found that car safe and reliable. LTI are able to operate 1 Mio kilometers, which is real advantage in relation to regular cars adapted for taxis. All LTI will be equipped with stickers: “driven by natural gas” which creates acceptance in society as safe and promotes natural gas as environment friendly fuel. Main data of car presents Table 1. Features of car are presented on Pictures 1-3.

Table 1 Technical specification of LTI TX4

Bodywork (doors)		4
Engine	ccm	2,4
	HP	around 160
Turning circle		Maximum 8,5m
Transmission		Manual 5 speed
Accessibility for disabled		Integrate wheelchair ramp
Service interval		16 000km
Kerb weight		1900 kg

Picture 1 Adaptation for disabled



Picture 2 Driver's cab



Picture 3 Cabin accustomed for 5 passengers



3 Calculations

Calculations of profitability of conversion has been made with “Tool for economical profitability of car conversion to natural gas” which is attachment for this study. The most important data needed for analysis are: fuel consumption, price of car and price of gas installation. Tool calculates financial effect – savings coming from gas installation. Picture 4 shows that after 100 000 kilometers savings on fuel equals 17% for LTI and 19% for Seat.

Picture 4 Savings on fuel after conversion to natural gas

Price net (PLN/l)		Price of installation (PLN)		Installation: ei		
Pb95	4,32	installation	6500,00	Prices: all pri		
ON	3,71	installation LTI	8000,00			
CNG m3	2,10					
Make	Seat			LTI		
Model	Altea			TX4		
Engine	1,6+CNG	1,6	1,9TDI	2,0+CNG	2,4	2,5 TDI
Price	63 500	63 500	70 000	99 900	99 900	105 300
Installation	6500,00			8000,00		
Overall price	70 000	63 500	70 000	107 900	99 900	105 300
Fuel consumption (city) l/km	8,8	11	7,5	11,2	14	8,8
Cost of fuel after mileage	10 000	1 848,00	4 752,00	2 782,50	2 352,00	6 048,00
	20 000	3 696,00	9 504,00	5 565,00	4 704,00	12 096,00
	50 000	9 240,00	23 760,00	13 912,50	11 760,00	30 240,00
	100 000	18 480,00	47 520,00	27 825,00	23 520,00	60 480,00
Price of car + cost of ride 100000km	88 480,00	111 020,00	97 825,00	131 420,00	160 380,00	137 948,00
Difference	0,00	22 540,00	9 345,00	0,00	28 960,00	6 528,00
Installation service costs	1 432			1 432		
Overall costs	89 912,00	111 020,00	97 825,00	132 852,00	160 380,00	137 948,00
+ financial effect	0,00	21 108,00	7 913,00	0,00	27 528,00	5 096,00
%		19%	8%		17%	4%

For NGV owner important question is after what mileage cost of installation will be repaid. It has been shown on Picture 5

Picture 5 Repayment of installation costs

Make		Seat			LTI		
Model		Altea			TX4		
Engine		1,6+CNG	1,6	1,9TDI	2,0+CNG	2,4	2,5 TDI
Overall price of fuel and car	0	70 000,00	63 500,00	70 000,00	107 900,00	99 900,00	105 300,00
	10 000	71 848,00	68 252,00	72 782,50	110 252,00	105 948,00	108 564,80
	20 000	73 696,00	73 004,00	75 565,00	112 604,00	111 996,00	111 829,60
	50 000	79 240,00	87 260,00	83 912,50	119 660,00	130 140,00	121 624,00
	75 000	83 860,00	99 140,00	90 868,75	125 540,00	145 260,00	129 786,00
	100 000	88 480,00	111 020,00	97 825,00	131 420,00	160 380,00	137 948,00
	150 000	97 720,00	134 780,00	111 737,50	143 180,00	190 620,00	154 272,00
	200 000	106 960,00	158 540,00	125 650,00	154 940,00	220 860,00	170 596,00
	250 000	116 200,00	182 300,00	139 562,50	166 700,00	251 100,00	186 920,00
After that mileage rapayment of costs occurs		Pb-CNG→	22 382,92			21 645,02	
		ON-Pb→	33 003,30			19 402,13	

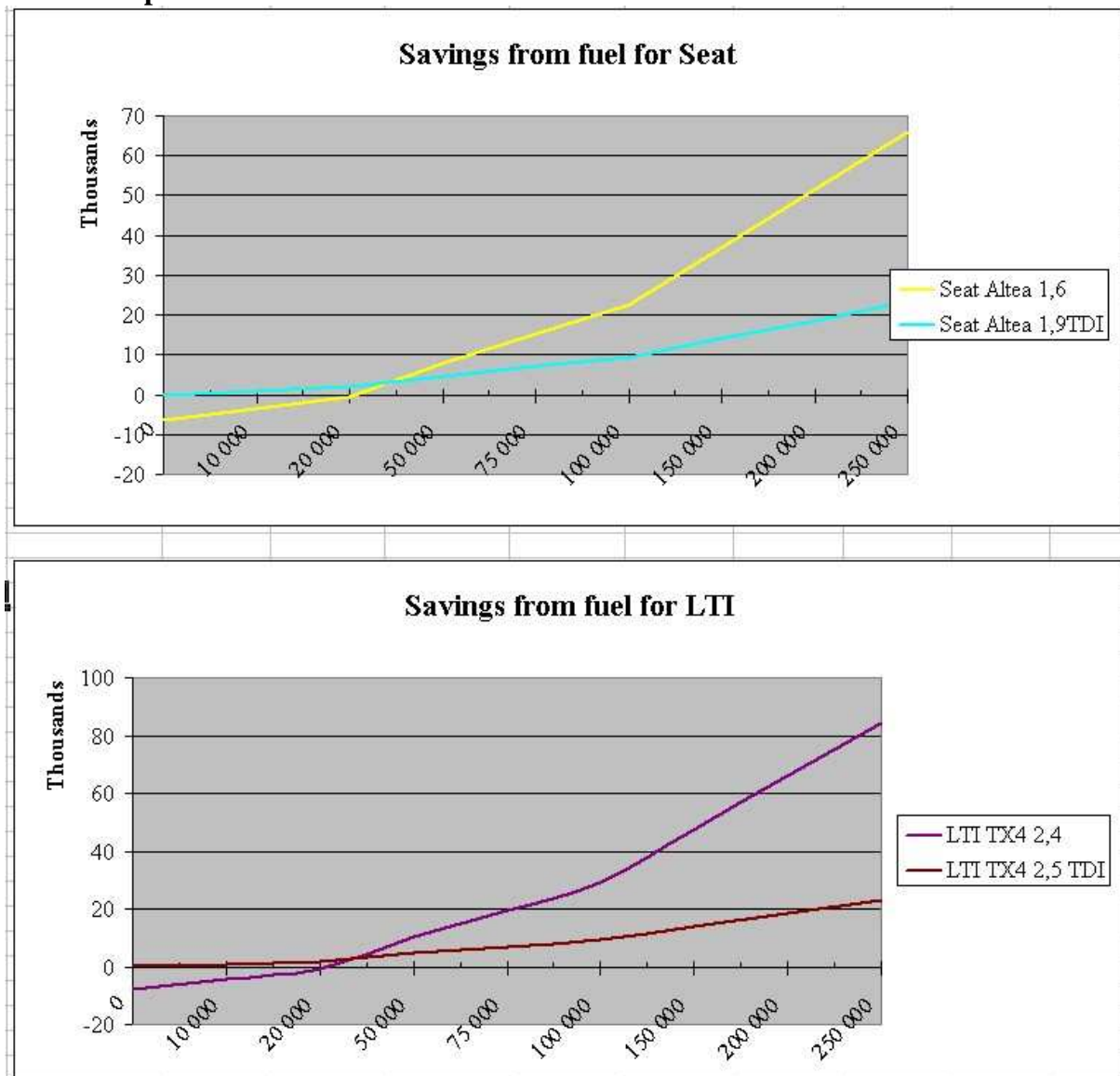
Analysis shows cumulated savings from fuel coming from natural gas installation in comparison to cars driven by petrol or diesel oil (Picture 6).

Picture 6 Savings coming from natural gas in relation to petrol and diesel oil

Make		Seat		LTI	
Model		Altea		TX4	
Engine		1,6	1,9TDI	2,4	2,5 TDI
Savings coming from installation	0	-6 500,00	0,00	-8 000,00	0,00
	10 000	-3 596,00	934,50	-4 304,00	912,80
	20 000	-692,00	1 869,00	-608,00	1 825,60
	50 000	8 020,00	4 672,50	10 480,00	4 564,00
	75 000	15 280,00	7 008,75	19 720,00	6 846,00
	100 000	22 540,00	9 345,00	28 960,00	9 128,00
	150 000	37 060,00	14 017,50	47 440,00	13 692,00
	200 000	51 580,00	18 690,00	65 920,00	18 256,00
	250 000	66 100,00	23 362,50	84 400,00	22 820,00

Savings coming from natural gas in relation to petrol and diesel oil are also presented on Picture 7. Notice that LTI TX4 driven by natural gas makes bigger savings on fuel with increasing mileage in relation to Seat Altea.

Picture 7 Comparison of profitability of conversion LTI and Seat to natural gas in relation to petrol and diesel oil



Picture 7 shows that conversion for both LTI and Seat is profitable. Taxi cabs in Wawa taxi makes around 100000 km per year which gives repayment of costs of installation in 3 months. Conclusions coming from analysis that conversion for natural cars makes significant profits especially in fleet use, ie: taxi cabs, delivery services.



LTI has some advantages over the Seats i.e.:

- Longer lifecycle of the cab. Taxi drivers says that 1Mio kilometers of exploitation is possible (Seat around 0,5 Mio)
- Handle 5 passengers (Seat 4)
- Very good image associated with reliability and safety
- Facilities for disabled people
- First taxi company nationwide with LTI



4. Summary

Feasibility study proved that conversion to natural gas is economically feasible. It makes savings on fuel for fleet owner, decreases gas and dust emissions to environment and creates acceptance to natural gas in society. Analysis shows that replacement of Seats by LTI is reasonable for Wawa Taxi. The main disadvantage are higher costs of car purchase in relation to Seat, however compensated by longer lifetime, friendly image and facilities for disabled. Taking into account all elements decision of replacing Seats by LTI is justified.