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Performance Study of a Rotary Under Heterogenous Traffic Flow Conditions (A Case Study Of Falomo - Awolowo Intersection, Eti-Osa Local Government, Lagos, Nigeria).

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Abstract— **The Falomo-Awolowo roundabout intersection (a 4-leg approach) was taken as a typical case study for performance analysis. The traffic conditions at the roundabout are heterogeneous. Entry capacity versus circulating flow relationship was determined, evaluated and compared using the TransModeler software, HCM Capacity Model (2000 and 2010), N.C.H.R.P Report 572 Capacity Model and the Modified Tanner's Capacity model. The results indicated that the circulating –flow capacity does not exceed the 1800 veh/h (2-Lane roundabout circulating-flow capacity limit). The entry capacity of HCM 2000 Capacity Model and N.C.H.R.P Report 572 Capacity Model are similar while there is an increase of entry capacity from the Modified Tanner's Capacity model. The degree of saturation (v/c ratio) on all the approaches is greater than 0.85, their LOS (F - Forced flow) because their average delay is greater than 50 seconds (HCM Capacity Model (2000 and 2010) and N.C.H.R.P Report 572 Capacity Model). The average delay (Modified Tanner's Capacity model) is 19 seconds (LOS C – stable flow), 30 seconds (LOS D – approaching unstable flow) and 76 seconds (LOS F – Forced flow). The TransModeler software result shows a higher entry capacity, higher average delays and poor LOS (LOS F – Forced flow).**

Index Terms— **Rotary Intersections; Heterogeneous Traffic Flow; Capacity; Conflicting –Movements; Level of Service.**

I. INTRODUCTION

The aim of this research is to evaluate the performance (Level of Service) of a typical major unsignalized intersection (case study of Falomo-Awolowo Intersection).

Lagos is one of the fastest growing cities in the world and has attracted major investments, businesses and immigrants from all parts of the country making the state over-populated [Zirra Banu, 2012]. With road as the major form of transportation, Lagos has an appreciable number of vehicles on the road network, round the clock, which has consequently reduced accessibility over time and space.

The case study (Falomo-Awolowo intersection) is one of the major intersections in the state that contribute to the day-to-day activities in Lagos State. The intersection is a direct link to some important places in the state, including, Ikoyi, Victoria Island Victoria Island, Lekki's port, the Mainland, Ibeju-Epe Area, Marina-CMS among many other places in Lagos.

The challenging geographical location of the city, coupled with inadequate and inefficient transport activities; the erratic behaviour of drivers and sudden surge in the car ownership have combined to complicate Lagos traffic problems [Adedimila, Adenle and Oyefesobi, 1981]. Traffic congestion wastes time and energy, causes pollution and stress, decreases productivity and imposes costs on society.

Traffic conflicts between vehicular movements are created when two or more roads crossed each other. Such conflicts may cause delay and traffic congestion with the possibility of road accidents. Thus, each intersection requires traffic control. It is regulated with stop signs, traffic lights, and roundabout. The common type of intersection is the unsignalized intersection, which is used to regulate low volume of traffic flow between the major and minor streets. The two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) are among the types of operation for unsignalized intersection.

II. LITERATURE REVIEW

[Aldian et al. 2001] examined the suitability of some traffic models to determine U-turn capacity at median openings. [Ian C. Espada et al. 2002] deals with the development of a priority intersection Capacity Formula that is sensitive to control type. [Ning WU, 1999] performed a simplest configuration with one Major stream and one Minor stream and a new universal capacity formula is introduced. [Tian et al. 1999] showed that most of the capacity calculation procedures for two-way stop-controlled (TWSC) intersections are based on gap acceptance models.

[Wan Hashim et al. 2007] showed that Critical Gap Acceptance procedure is still widely used for estimating capacity of unsignalized intersection. [Werner Brilon et al. 1996] deals with the capacity of minor traffic movements across major divided four-lane roadways (also other roads with two separate carriageways) at unsignalized intersections. [Werner Brilon et al. 1997] has performed a series of comprehensive simulations of some of the estimation methods.

[McDonald and Armitage, 1978] and [Siegloch, 1973] independently described a concept where a lost time is subtracted from each major stream gap and the remaining time is considered 'useable.' This 'useable' time divided by the saturation flow gives an estimate of the absorption capacity of the minor stream.

Early roundabout crash patterns were extensively studied in Europe and Australia. In the 1980s, researchers studied crashes at 84 four-leg roundabouts in the United Kingdom [Cock & Hall, 1984]. Entering-circulating crashes were found

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to be most prevalent (71.1%) among all types of crashes for "small" roundabouts, that is, roundabouts with a central island no smaller than 13 feet (3.96 meters) in diameter and a large ratio of inscribed circle diameter to centre island diameter. For conventional roundabouts, that is, those having a larger diameter than "small" roundabouts, entering-circulating crashes, approaching crashes (within approaches only), and single-vehicle crashes were found to be the three main crash types, proportioned as 20.3%, 25.3%, and 30.0%, respectively.

III. RESEARCH METHODOLOGY

Data Collection

The study area has a double lane roundabout with the inscribed circle diameter (Central Island) approximately 38 meters. The following are the four major roadways/approaches; Awolowo Road, Bourdillon Road, Alfred -Rewane Road and Akin-Adeshola Road. The traffic data was manually collected for the roundabout with special emphasis on vehicle classifications, volume and turning movements for 3days in a week (Monday, Wednesday and Saturday) for12 hours periods at 15-minutes interval (7:00A.M - 7:00PM).

HCM CAPACITY MODEL (2000 and 2010)

Capacity $= C_a = \dfrac{v_c e^{-v_c t_c/3600}}{1-e^{-v_c t_f/3600}}$ (1)

where:

c_a = approach capacity (veh/h) v_c = conflicting circulating traffic (veh/h)

t_c = critical gap (s), and t_f = follow up time (s).

Vehicle – Capacity Ratio Computation (Degree of Saturation)

v/c Ratio = $\dfrac{v_a(Approach\ Road)}{C_E(Approach\ Road)}$ (2)

Modified Tanner's Entry Capacity Model (Conflict Technique)

C_{entry} = 3600 $\left(1 - \dfrac{\Delta.Q_c}{3600.N_c}\right)^{N_c}$. $\dfrac{N_e}{T_f}$. exp $\left[-Q_c \frac{1}{3600}(T_0 - \Delta)\right]$ (3)

$T_0 = \left(T_C - \frac{T_f}{2}\right)$

where;

C_{entry} = Entry capacity (veh/hr),

Q_c = circulating or conflicting flow in front of each entry approach (veh/hr)

N_C = Number of circulating lanes, N_e = Number of lanes in subject entry approach,

t_C = Critical headway (sec), t_f = Follow-up headway (sec).

Δ = headway between the conflicting vehicles (minimum) (sec).

The values for t_c and t_f is presented in Table 1.

TABLE 1: CRITICAL GAP AND FOLLOW-UP TIMES FOR ROUNDABOUT (HCM 2000)

	Critical Gap (s) t_c	Follow-Up Time (s) t_f
Upper Bound	4.1	2.6
Lower Bound	4.6	3.1

Entry (approach) Capacity Estimation

$$C_{entry} = \frac{Q.e^{-\frac{QT_C}{3600}}}{1-e^{-\frac{QT_f}{3600}}} \quad (4)$$

where;

C_{entry} = Entry (approach) Capacity (vehicles/hour), T_C = Critical headway (sec),

Q = Circulating Flow or conflict flow (vehicles/hour), T_f = Follow-up headway (sec).

See Table 1 for t_c and t_f values.

N.C.H.R.P. Report 572 Capacity Model for the Entry Capacity of roundabouts

C_{entry}= a.exp (-b. Q_c) (5) a = $\left(\dfrac{3600}{T_f}\right)$ b= $\dfrac{\left(T_C - \frac{T_f}{2}\right)}{3600}$ (6)

where;

C_{entry} = entry (approach) capacity ((veh/hr)), Q_c = conflicting flow ((veh/hr)),

T_C = Critical headway (sec), T_f = Follow-up headway (sec).

Average Control Delay (Delay Analysis)

The model for delay estimation is based on the F.H.W.A. Report, is given by:

$d_{avg} = \dfrac{3600}{C}$ + 900. T$\left[(s-1) + \sqrt{(s-1)^2 + \dfrac{\frac{3600}{C}s}{450.T}}\right]$

(7)

where;

d_{avg} = avg. control delay, **s** = degree of saturation,

C = capacity, **T** = time period (T=1.5 for 1.5 hour, T= 0.166 for 10 minutes)

See Table 1 for t_c and t_f values.

The HCM defines LOS for signalized and unsignalized intersections as a function of the average vehicle control delay and is presented in Table 2

TABLE 2: H.C.M. 2000 LEVEL OF SERVICE DEFINITION BASED ON DELAY AND V/C

LOS	Signalized Intersection	Unsignalized Intersection
A	≤ 10 sec	≤10 sec
B	10 – 20 sec	10–15 sec
C	20 – 35 sec	15–25 sec
D	35 – 55 sec	25–35 sec
E	55 – 80 sec	35–50 sec
F	≥80 sec	≥50 sec

The TransModeler Software

TransModeler software is a complete traffic analysis solution. It can complete a traffic impact study; build/No build scenario management, trip distribution, HCM 2000, 2010 LOS analysis, traffic signal optimization, and 3-D visualization. It analyse traffic signal operations on coordinated arterials or at isolated intersections.

RESULTS AND DISCUSSION

The peak hour average data (Monday, Wednesday and Saturday) for A.M and P.M collected at Falomo-Awolowo roundabout is summarised in Table 3.

TABLE 3: AVERAGE SUMMARY OF DATA COLLECTION (A.M and P.M PEAK)

		Average Peak Hour Volume on All Approaches (veh/h)							
Approach	**Average Daily Volume on All Approaches (veh/day)**	**Left + U Turn (LT)**		**Through Turn (TH)**		**Right Turn (RT)**		**TOTAL**	
		A.M	**A.M**	**A.M**	**P.M**	**A.M**	**P.M**	**A.M**	**P.M**
Awolowo Road	9,123	320	528	528	321	343	321	1,191	1,125
Bourdillon Road	11,138	291	931	931	113	151	113	1,373	1,133
Alfred-Rewane Rd	7398	272	412	412	285	354	285	1,038	833
Akin-Adeshola Rd	12,213	300	618	618	634	956	634	1,874	1,343

TransModeler Software Results for Delays

The TransModeler software results for the average control delay, LOS and capacity of vehicles at the intersection are summarised in Tables 4, 5 and 6.

TABLE 4: SERVICE BY APPROACH: AVERAGE CONTROL DELAY (sec/veh) ACROSS 5 SIMULATIONS (7:00-8:00AM)

APPROACH	AVERAGE	STANDARD DEVIATION	MIN	MAX	NO. OF SAMPLES
14 (E), 22 (SW) & 21 (N) :NODE 1					
NW (AWOLOWO/AKIN-ADESHOLA)	55.9	1.8	53.5	58.2	5
18 (N), 5(NW), 24(SE) : NODE 13					
SE (BOURDILLON/ALFRED REWANE)	103.4	4.2	97.0	108.2	5
17(S), 25(NW), 18(S) : NODE17					
N (AWOLOWO)	136.8	6.0	128.7	147.0	5
2(NE), 20 (SE), 19(SW) : NODE 20					
SW (BOURDILLON/ AKIN ADESHOLA)	42.3	9.2	33.5	59.6	5

Awolowo approach road experienced higher delay (average delay is 136.8 ≥50 sec and LOS is F) while, Bourdillon / Akin Adeshola approach road experienced lesser delay (average delay is 42.3 ≤50 sec and LOS is E). See Table 2.

TABLE 5: SUMMARY AGGREGATE REPORT FOR FALOMO-AWOLOWO INTERSECTION LEVEL OF SERVICE BY APPROACH: LEVEL OF SERVICE ACROSS 5 SIMULATIONS (7:00-8:00AM)

APPROACH	MIN	MAX	NUMBER OF SAMPLES
14(E), 22(SW), 21(N): NODE 1			
NW (Awolowo/AkinAdeshola)	F	F	5
18 (N), 5(NW), 24(SE) : NODE 13			
SE (Bourdillon/Alfred-Rewane)	F	F	5
17(S), 25(NW), 18(S) : NODE17			
N (AWOLOWO)	F	F	5
2(NE), 20 (SE), 19(SW) : NODE 20			
SW (Bourdillon/ Akin Adeshola)	D	F	5

Bourdillon approach road is unstable (Level D) while (Awolowo, Alfred-Rewane and Akin-Adeshola) are on a forced/breakdown flow during the peak hour (Level F). See Table 2.

TABLE 6: SUMMARY AGGREGATE REPORT FOR FALOMO-AWOLOWO INTERSECTION LEVEL OF SERVICE BY APPROACH: NUMBER OF VEHICLES ACROSS 5 SIMULATIONS (7:00-8:00AM)

APPROACH	AVERAGE	STANDARD DEVIATION	MIN	MAX	NUMBER OF SAMPLES
14(E), 22(SW), 21(N): NODE 1					
NE (AWOLOWO/AFRED REWANE)	583.0	156.7	278.0	696.0	5
NW (AWOLOWO/AKIN-ADESHOLA)	735.2	199.8	351.0	902.0	5
24(NW), 16(S), 25(SE): NODE 4					
SE (BOURDILLON/ALFRED REWANE)	1,271.2	351.3	578.0	1,508.0	5
21(S), 7(NE), 20(NW): NODE 5					
N (AWOLOWO)	1,317.4	355	629	1,579	5
18(N), 5(NW), 24(SE): NODE 13					
SE (BOURDILLON/ALFRED REWANE)	528.6	147.3	248.0	658	5
S (BOURDILLON)	744.6	208.3	333	902	5
23(W), 22(NE), 15(E): NODE 14					
E (ALFRED REWANE)	986	271.2	452	1,173	5
17(S), 25(NW), 23(E): NODE 17					
N (AWOLOWO)	279.8	77.7	127	339	5
SE (BOURDILLON/ALFRED REWANE)	708.8	193.5	328	835	5
19(NE), 13(NW), 18(S): NODE 18					
SW (BOURDILLON/ AKIN ADESHOLA	1,412.8	389.6	646	1,704	5
2(NE), 20(SE), 19(SW): NODE 20					
NW(AWOLOWO/AKIN-ADESHOLA)	581	158.6	276	691	5
W (AKIN ADESHOLA)	835.8	233.1	376	1,015	5

Awolowo approach has 1317 vehicles, Bourdillon 745 vehicles, Alfred-Rewane 986 vehicles and Akin-Adeshola 836 vehicles.

HCM Model (2000 and 2010) Capacity Results

The approach flow computation, circulating computation, capacity computation and degree of saturation (v/c ratio) using HCM Model (2000 and 2010) Capacity for the A.M and P.M peak hours are presented in Table 7.

The circulating/conflicting flows are less than 1800 veh/h but their degree of saturation (v/c ratio) is greater than 0.85 during the A.M and P.M Peak-hours. Their average delay is greater than 50 seconds on all the approaches, their LOS is poor (see Table 2).

TABLE 7: HCM MODEL (2000 and 2010) CAPACITY FOR FALOWO-AWOLOWO INTERSECTION. (A. M and P.M PEAK HOUR)

		E (ALFRED-REWANE)		W (AKIN ADESHOLA)		N (AWOLOWO)		S (BOURDILLON)	
		A.M	P.M	A.M	P.M	A.M	P.M	A.M	P.M
LEFT + U TURN	Movement	v_1		v_4		v_7		v_{10}	
	Volume(veh/h)	272	253	300	287	320	299	291	224
	PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Flow Rate (veh/h)	272	253	300	287	320	299	291	224
THROUGH TURN	Movement	v_2		v_5		v_8		v_{11}	
	Volume(veh/h)	412	295	618	422	528	505	931	796
	PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Flow Rate (veh/h)	412	295	618	422	528	505	931	796
RIGHT TURN	Movement	v_3		v_6		v_9		v_{12}	
	Volume(veh/h)	354	285	956	634	343	321	151	113
	PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Flow Rate (veh/h)	354	285	956	634	343	321	151	113

Approach Flow Computation

Approach Flow (veh/h)	v_a**(veh/h)**	
	A.M	**P.M**
v_a**E** (Alfred Rewane) = $v_1 + v_2 + v_3$	1,038	833
v_a**W** (Akin Adeshola) = $v_4 + v_5 + v_6$	1,874	1,343
$v_a N$ (Awolowo) = $v_7 + v_8 + v_9$	1,191	1,125
$v_a S$ (Bourdillon) = $v_{10} + v_{11} + v_{12}$	1,373	1,133

Circulating Flow Computation

Circulating Flow (veh/h)	v_c**(veh/h)**	
	A.M	**P.M**
v_cE (Alfred Rewane) = $v_4 + v_{10} + v_{11}$	1,522	1,307
v_c**W** (Akin Adeshola) = $v_1 + v_7 + v_8$	1,120	1,057
$v_c N$ (Awolowo) = $v_1 + v_2 + v_{10}$	975	772
$v_c S$ (Bourdillon) = $v_4 + v_5 + v_7$	1,238	1,008

Capacity Computation

		E (ALFRED REWANE)		**W**(AKIN-ADESHOLA)		N (AWOLOWO)		S (BOURDILLON)	
		A.M	**P.M**	**A.M**	**P.M**	**A.M**	**P.M**	**A.M**	**P.M**
Entry Capacity	Upper Bound	403	483	564	594	635	749	511	619
	Lower Bound	299	364	433	459	494	593	389	479
v/c Ratio	Upper Bound	2.6	1.7	3.3	2.3	1.9	1.5	2.7	1.8
	Lower Bound	3.5	2.3	4.3	2.9	2.4	1.9	3.5	2.4
d_{avg} **(sec)**		243	106	348	197	136	76	258	121

Modified Tanner's Capacity Model (Conflict Technique)

The conflict technique capacity model for entry capacity analysis and the minimum headway at all the approaches of Falomo – Awolowo Roundabout during A.M and P.M peak hours is presented in Table 8. The roundabout circulating-flow capacity comparison is presented in Table 9.

TABLE 8: MODIFIED TANNER'S CAPACITY MODEL (CONFLICT TECHNIQUE) A.M AND P.M PEAK HOURS

Peak Hour	Headway between the conflicting vehicles (Δ) (minimum, sec).		Average peak value		Capacity (veh/hour)		v/c Ratio		d_{avg} (sec)		Level of Service (LOS)	
	A.M	P.M	A.M	P.M	A.M	P.M	A.M	P.M	A.M	P.M	A.M	P.M
Awolowo Road	16	16	320	299	747	934	1.6	1.2	90	30	F	D
Bourdillon Road	18	22	291	224	703	912	2.0	1.2	151	30	F	D
Alfred Rewane Road	18	19	272	253	895	956	1.2	0.87	30	19	D	C
Akin-Adeshola Road	17	17	300	287	770	894	2.4	1.5	212	76	F	F

For A.M peak hour: the least minimum headway is on Awolowo road and the highest on Bourdillon road and Alfred-Rewane Road. Alfred-Rewane road has the highest capacity (895veh/hr) and Akin-Adeshola with the lowest capacity (770veh/hr). The degree of saturation (v/c ratio) is greater than 0.85 at all approaches. The average delay is greater than 50 seconds on all the approaches (LOS F – Breakdown flow) except on Alfred-Rewane road (LOS D- Approaching unstable flow), see Table 2.

For P.M peak hour: the least minimum headway is on Awolowo road and the highest on Bourdillon road. Alfred-Rewane road has the highest capacity (956 veh/hr) while Akin-Adeshola road has the lowest capacity (894 veh/hr). The degree of saturation (v/c ratio) is greater than 0.85 except on Alfred-Rewane (0.87) which is closer to 0.85 than the other approaches. The average delay is 30 seconds on Awolowo and Bourdillon road (LOS D – approaching unstable flow), 19 seconds on Alfred-Rewane road (LOS C – stable flow) and 76 seconds on Akin-Adeshola road (LOS F – breakdown flow); therefore the roundabout performs better at P.M peak hour.

TABLE 9: ROUNDABOUT CIRCULATING- FLOWCAPACITY COMPARISON BETWEEN HCM MODEL (2000 and 2010) AND N.C.H.R.P. REPORT 572 CAPACITY MODEL

	HCM MODEL (2000 and 2010) CAPACITY MODEL		**N.C.H.R.P. REPORT 572 CAPACITY MODEL**	
	Capacity (veh/h)		Capacity (veh/h)	
	A.M	P.M	A.M	P.M
Awolowo Road	975	772	1,072	1,090
Bourdillon Road	1,238	1,008	1,097	1,157
Alfred Rewane Road	1,522	1,307	1,114	1,131
Akin-Adeshola Road	1,120	1,057	1,089	1,101

Roundabout Entry Capacity Comparison

The roundabout entry capacity comparison between HCM Model (2000 and 2010), N.C.H.R.P. and Modified Tanner's capacity model are presented in tables 10 and 11.

TABLE 10: ENTRY CAPACITY COMPARISON BETWEEN HCM MODEL (2000 and2010), N.C.H.R.P. REPORT 572 CAPACITY MODEL AND MODIFIED TANNER'S CAPACITY MODEL

A.M PEAK HOUR	HCM 2000 MODEL				N.C.H.R.P. REPORT 572 CAPACITY MODEL				MODIFIED TANNER'S CAPACITY MODEL			
	Entry Capacity (veh/hr)	Degree of Saturation (v/c ratio)	d_{avg} (sec)	Level of Service (LOS)	Entry Capacity (veh/hr)	Degree of Saturation (v/c ratio)	d_{avg} (sec)	Level of Service (LOS)	Entry Capacity (veh/hr)	Degree of Saturation (v/c ratio)	d_{avg} (sec)	Level of Service (LOS)
Awolowo	635	1.9	136	F	635	1.7	106	F	747	1.6	90	F
Bourdillon	511	2.7	258	F	514	2.1	167	F	703	2	151	F
Alfred Rewane	403	2.6	243	F	410	2.7	258	F	895	1.2	30	D
Akin-Adeshola	564	3.3	348	F	565	1.9	136	F	770	2.4	212	F

TABLE 11: ENTRY CAPACITY COMPARISON BETWEEN HCM MODEL (2000and2010), N.C.H.R.P. REPORT 572 CAPACITY MODEL AND MODIFIED TANNER'S CAPACITY MODEL

P.M PEAK HOUR	HCM 2000 MODEL				N.C.H.R.P. REPORT 572 CAPACITY MODEL				MODIFIED TANNER'S CAPACITY MODEL			
	Entry Capacity (veh/hr)	Degree of Saturation (v/c ratio)	d_{avg} (sec)	Level of Service (LOS)	Entry Capacity (veh/hr)	Degree of Saturation (v/c ratio)	d_{avg} (sec)	Level of Service (LOS)	Entry Capacity (veh/hr)	Degree of Saturation (v/c ratio)	d_{avg} (sec)	Level of Service (LOS)
Awolowo	749	1.5	76	F	747	1.5	75	F	934	1.2	30	D
Bourdillon	619	1.8	121	F	618	1.9	136	F	912	1.2	30	D
Alfred Rewane	483	1.7	106	F	487	2.3	197	F	956	0.87	19	C
Akin-Adeshola	594	2.3	197	F	594	1.9	136	F	894	1.5	76	F

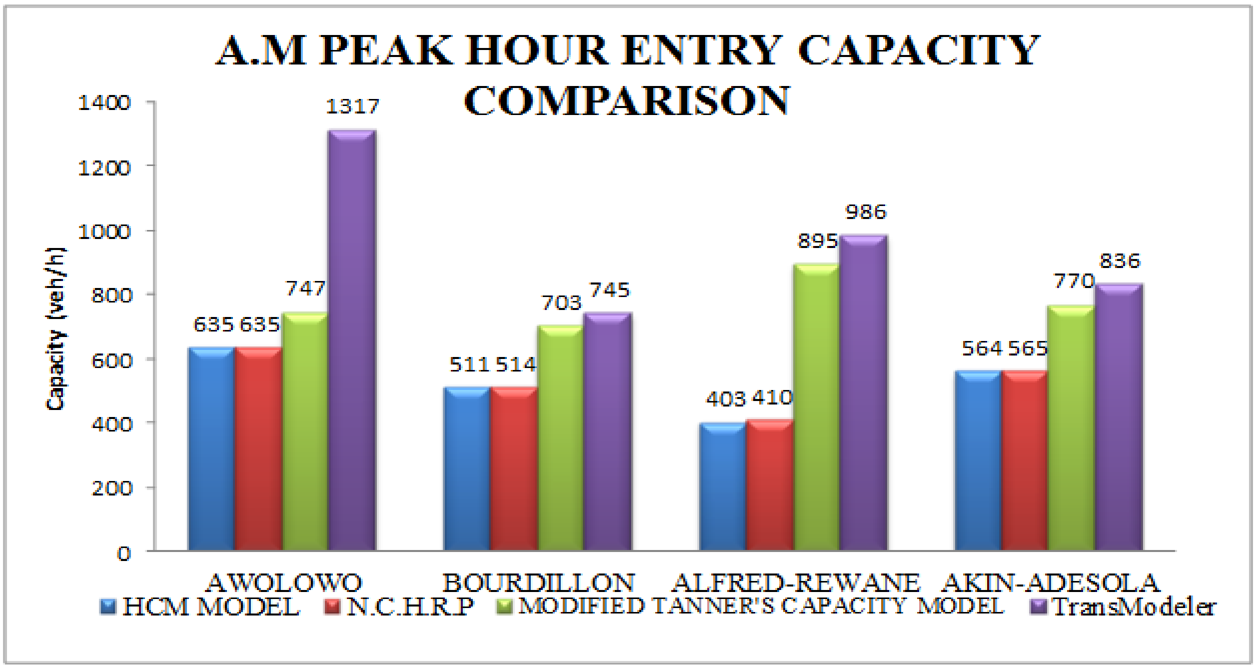

Figure 4.12: Entry Capacity Comparison of Traffic Movements at Falomo-Awolowo Intersection (Roundabout) during A.M Peak-Hour (Veh/h)

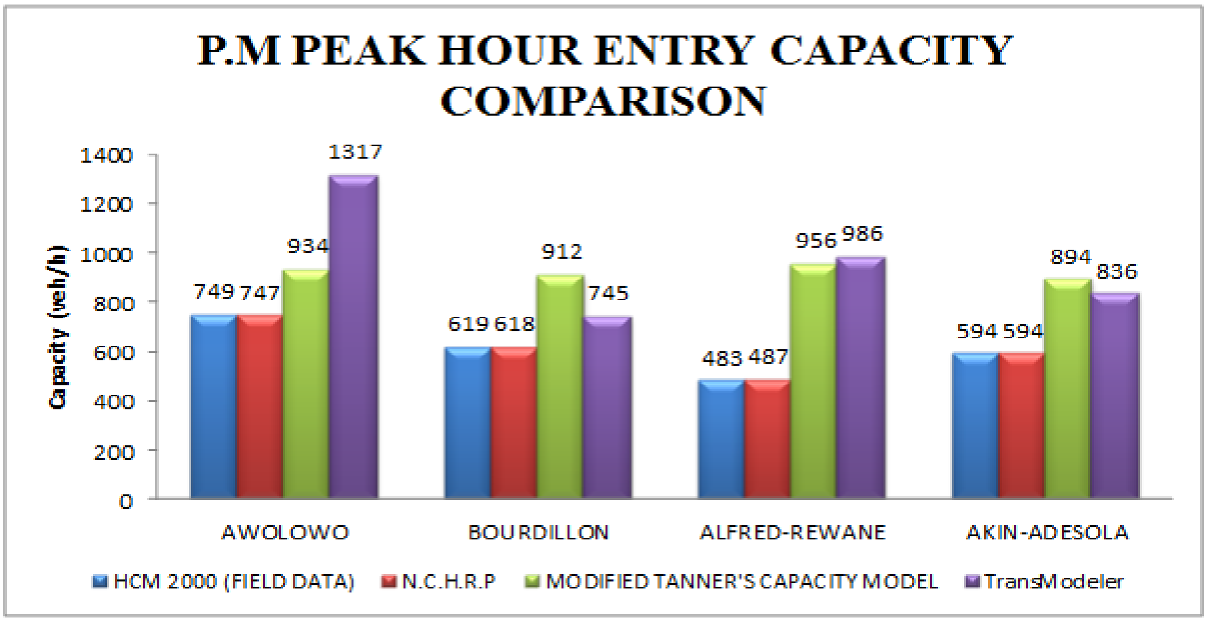

Figure 4.13: Entry Capacity Comparison of Traffic Movements at Falomo-Awolowo Intersection (Roundabout) during P.M Peak-Hour (Veh/h)

IV. Conclusion

The TransModeler software result shows a higher entry capacity, higher average delays and poor LOS. The HCM Model (2000 and 2010) and N.C.H.R.P Report 572 Model have similar circulating-flow capacity, entry capacity, higher degree of saturation (v/c ratio), higher average delays and poor level of service (LOS). However, the Modified Tanner's Capacity Model result shows a higher circulating-flow capacity, entry capacity, degree of saturation, lesser average delays and an improved level of service. This is as a result of the additional parameter (minimum headway) considered by the Modified Tanner's Capacity Model. Therefore, the performance of the rotary can be said to be averagely fair.

V. Recommendations

Regular traffic data collection should be carried out and analysed regularly on all major intersections (signalised and unsignalized) in Lagos State. The results will greatly assist in improving the performance of intersections and contribute to an effective road networks in Lagos State. The data collection done in this study was collected for 3 days as a result of cost, safety and manpower. The Lagos state government should create a traffic unit for the purpose of traffic data collection, analysis and appraisal for all major intersections on a regular interval.

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