Diyala Journal of Engineering Sciences

Second Engineering Scientific Conference College of Engineering –University of Diyala 16-17 December. 2015, pp. 343-354

SHORT CIRCUIT ANALYSIS FOR POWER SYSTEM NETWORKS

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ABSTRACT:- In this paper analysis to electrical power network design under applying many types of a short circuit on lines and buses. In order to maintain the continuation of power supply to all customers which is the core purpose of the power system existence, Short circuit problem is one of the most important and complex task in electrical Power Engineering. The studies and detection of these faults is necessary to ensure that the power system is reliable and stable. The severity of the fault depends on the short-circuit location, and the path taken by fault current, the system impedance and its voltage level. In This paper analyzes the behavior of a system under fault conditions and evaluates different types of faults. Power world simulator was used to simulate IEEE30- bus. All results achieved and discussed.

1- INTRODUCTION

During normal operating conditions, current will flow through all elements of the electrical power system with in pre-designed values which are appropriate to these elements' ratings. Any power system can be analyzed by calculating the system voltages & currents under normal & abnormal scenarios [1]. Unfortunately, faults could happen as a result of natural events or accidents where the phase will establish a connection with another phase, the ground or both in some cases[2]. A falling tree on a transmission lines could cause a three-phase fault where all phases share a point of contact called fault location. In different occasions, fault could be a result of insulation deterioration, wind damage or human vandalism.

Faults can be defined as the flow of a massive current through an improper path which could cause enormous equipment damage which will lead to interruption of power, personal injury, or death. In addition, the voltage level will alternate which can affect the equipment insulation in case of an increase or could cause a failure of equipment start-up if the voltage is below a minimum level. As a result, the electrical potential difference of the system neutral will increase [1].Hence, People and equipment will be exposed to the danger of electricity which is not accepted. In order to prevent such an event, power system fault analysis was introduced.

The process of evaluating the system voltages and currents under various types of short circuits is called fault analysis which can determine the necessary safety measures & the required protection system [2]. It is essential to guarantee the safety of public [3]. The analysis of faults leads to appropriate protection settings which can be computed in order to select suitable fuse, circuit breaker size and type of relay [1]. The severity of the fault depends on the short-circuit location, the path taken by fault current, the system impedance and its voltage level. In order to maintain the continuation of power supply to all customers which is the core purpose of the power system existence, all faulted parts must be isolated from the system temporary by the protection schemes. When a fault exists within the relay

protection zone at any transmission line, a signal will trip or open the circuit breaker isolating the faulted line.

To complete this task successfully, fault analysis has to be conducted in every location assuming several fault conditions. The goal is to determine the optimum protection scheme by determining the fault currents & voltages. In reality, power system can consist of thousands of buses which complicate the task of calculating these parameters without the use of computer software.

There are two types of faults which can occur on any transmission lines; balanced faults & unbalanced faults. In addition, unbalanced faults can be classified into single line-to-ground faults, double line faults and double line-to-ground faults. In this peppier will calculate the fault by using power word program in all types of the fault.

In this paper all types of fault cases was considered, power world simulator was used to accomplish this work.

2- DESIGN AND POWER WORLD SIMULATION

IEEE 30 bus base case load flow was setup using Power World simulator. Figure 1 shows the setup in Power World in Edit Mode and Figure 2 shows the setup in Power World software in Run Mode

3-Results and Discussion

This discussion done for all types of fault listed earlier. Then, the comments and recommendations will be provided based on that. When using power word program we can calculate the current fault in all types of fault

I. Single Line-to-Ground Fault

The single line-to-ground fault is usually referred as "short circuit" fault and occurs when one conductor falls to ground or makes contact with the neutral wire. The general representation of a single line-to-ground fault is shown in Figure 3. Where **F** is the fault point with impedances Zf. Figure 4 shows the sequences network diagram. Phase a is usually assumed to be the faulted phase, this is for simplicity in the fault analysis calculations ⁽¹⁾.

Since the zero-, positive-, and negative-sequence currents are equals as it can be observed in Figure 4. Therefore,

$$I_{a0} = I_{a1} = I_{a2} = \frac{1.0 \angle 0^{\circ}}{Z_0 + Z_1 + Z_2 + 3Z_f}$$

...1

.....4

Since

I_{af}		1	1	1	I_{a0}
$egin{array}{c} I_{bf} \ I_{cf} \end{array}$	=	1	a^2	a	I _{a1}
I_{cf}		1	a	a^2	I_{a2}

Solving Equation the fault current for phase a is

$$I_{af} = I_{a0} + I_{a1} + I_{a2}$$

It can also be

$$I_{af} = 3I_{a0} = 3I_{a1} = 3I_{a2}$$

From Figure 3it can be observed that,

The voltage at faulted phase a can be obtained by substituting Equation 2 into Equation 5. Therefore,

Figure 5 show power world simulators to calculate fault current the type single line to ground.

I. Line-to-Line Fault

Line to line fault the figure 2 show the magnitude of current in per unit when we selected the bus number 23 and the voltage under fault condition in phase B & C it lower than all phases.

The general representation of a line-to-line fault is shown in Figure 3.12 where F is the fault point with impedances Zf. Figure 6 shows the sequences network diagram. Phase b and c are usually assumed to be the faulted phases; this is for simplicity in the fault analysis calculations

From Figure 7 it can be noticed that

$$I_{af} = 0$$

$$I_{bf} = -I_{cf}$$

$$V_{bc} = Z_f I_{bf}$$
12

And the sequence currents can be obtained as

$$I_{a0} = 0$$

If $Z_{f} = 0$,

$$I_{a1} = -I_{a2} = \frac{1.0 \angle 0^{\circ}}{Z_1 + Z_2}$$

With the results obtained for sequence currents, the sequence voltages can be obtained from

V_{a0}		0] [1	1	$\begin{bmatrix} 1 \\ a \end{bmatrix} \begin{bmatrix} I_{a0} \\ I_{a1} \end{bmatrix}$	
V_{b1}	=	1.0∠0°	- 1	a^2	$a \mid I_{a1}$	
		0	[1	а	$a^2 \begin{bmatrix} a_1 \\ I_{a2} \end{bmatrix}$	15

The sequence voltages can be found similarly by substituting Equations 13 and 14 into Equation 14

$$V_{a0} = 0$$

$$V_{a1} = 1.0 - Z_1 I_{a1}$$

$$V_{a2} = -Z_2 I_{a2} = Z_2 I_{a1}$$

Finally, the line-to-line voltages for a line-to-line fault can be expressed as

The figure 8 show using power world program to calculate current in the type fault line to line

I. Double Line-to-Ground Fault

Double line to ground fault figure 4 show the magnitude of current in per unit when we selected the bus number 23 and the voltage under fault condition in B & C is 0

The general representation of a double line-to-ground fault is shown in Figure 3.14 where F is the fault point with impedances Zf and the impedance from line to ground Zg. Figure 3.15 shows the sequences network diagram. Phase b and c are assumed to be the faulted phases, this is for simplicity in the fault analysis calculations. [1]

From Figure 10 it can be observed that

If Zf and Zg are both equal to zero, then the positive-, negative-, and zero- sequences can be obtained from

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The figure 11 show using power world program to calculate current in the type fault double line to ground.

II.Three-Phase Fault

Three phase balanced fault the figure 3 show the magnitude of current in per unit when we selected the bus number 23 and the voltage under fault condition in all phases is 0.A general representation of a balanced three-phase fault is shown in Figure 12 where F is the fault point with impedances Zf and Zg . Figure 13 shows the sequences networks interconnection diagram.

From Figure 13 it can be noticed that the only one that has an internal voltage source is the positive-sequence network. Therefore, the corresponding currents for each of the sequences can be expressed as

$I_{a0} = 0$
$I_{a2} = 0$ $I_{a1} = \frac{1.0 \angle 0^{\circ}}{Z_1 + Z_f}$ If the fault impedance Zf is zero,
$I_{a1} = \frac{1.0 \angle 0^{\circ}}{Z_1}$ If equation is substituted into equation
If equation is substituted into equation Z_1
$\begin{bmatrix} I_{af} \\ I_{bf} \\ I_{cf} \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ 1 & a^2 & a \\ 1 & a & a^2 \end{bmatrix} \begin{bmatrix} 0 \\ I_{a1} \\ 0 \end{bmatrix}$ Solving Equation 22
$I_{af} = I_{a1} = \frac{1.0 \angle 0^{\circ}}{Z_1 + Z_f},$
$I_{bf} = a^2 I_{a1} = \frac{1.0 \angle 240^\circ}{Z_1 + Z_f},$
$I_{cf} = aI_{a1} = \frac{1.0 \angle 120^{\circ}}{Z_1 + Z_2} \qquad$
$I_{af} = \frac{1.0 \angle 0^{\circ}}{Z_{1}}$ $I_{bf} = \frac{1.0 \angle 240^{\circ}}{Z_{1}},$ The phase voltages becomes, $I_{cf} = \frac{1.0 \angle 120^{\circ}}{Z_{1}}$
$V_{af} = 0$ $V_{bf} = 0$ $V_{cf} = 0$
And the line voltages, $V_{a0} = 0$ $V_{a1} = 0$

The figure 14 show using power world program to calculate current in the type fault three phase

4-CONCLUSIONS

In this paper, fault analysis was done for a 30 bus system where bus number twenty three was the main focus of this report. The following observations have been made based on the results obtained from the analysis:

• In three-phase fault, the voltages at faulted bus phases dropped to zero during the fault. The faulted bus is bus number four where Phase A, B and C has a zero voltage potential.

• However, only voltage at Phase A is equal to zero in single line-to-ground fault. In addition, only Phase A has current since it is the faulted phase in this type of fault as we assumed earlier in the mathematical model. This current is the second highest fault currents of all types.

• Since Phase B and Phase C are in contact in line-to-line fault, the voltages at both phases are equal. The fault current are passing from B to C. in Phase A, the current is equal to zero compared to the fault current.

• In double line-to-ground fault, Phase B and C voltages are equal to zero. The faulted current is flowing through both phases only. In addition, this type of

5-References

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Bus No.	NAME	PHASE A	PHASE B	PHASE C	PHASE A	PHASE B	PHASE C
		VOLT	VOLT	VOLT	ANGLE	ANGLE	ANGLE
23	23	0.00000	1.27608	1.19202	0.00000	-144.04	117.06

Tabl-1 show the result of voltage at bus bar [23] under single line to ground fault

Tabl-2 show the result of voltage at bus bar [23] under line to line fault

	I wer = bille		si tenned at				
NUMBER	NAME	PHASE	PHASE	PHASE	PHASE	PHASE	PHASE
		VOLT A	VOLT B	VOLT C	ANGLE A	ANGLE B	ANGLE C
23	23	1.08320	0.54159	-15.16	-15.16	164.84	164.84

Tabl-3 show the result of voltage at bus bar 23 under double line to ground fault

NUMBER	NAME	PHASE	PHASE	PHASE	PHASE	PHASE	PHASE
		VOLT A	VOLT B	VOLT C	ANGLE A	ANGLE B	ANGLE C
23	23	1.29446	0.0000	0.0000	-13.57	0.00	0.00

Tabl-4 show the result of voltage at bus bar [23] under three phase fault

NUMBER	NAME	PHASE	PHASE	PHASE	PHASE	PHASE	PHASE
		VOLT A	VOLT B	VOLT C	ANGLE A	ANGLE B	ANGLE C
23	23	0.0000	0.0000	0.0000	0.00	0.00	0.00

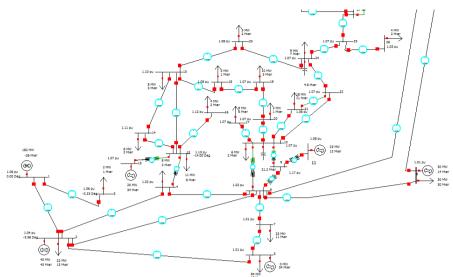


Figure 1: IEEE 30 bus base case load flow in edit mode.

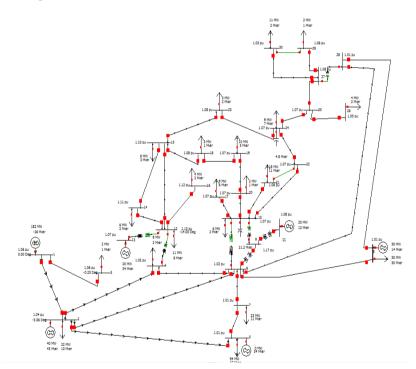


Figure 2 shows the setup in Power World in Run Mode

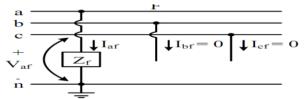


Figure 3 General representation of a single line-to-ground fault.

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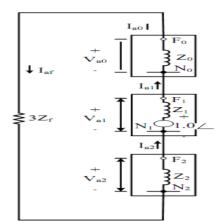


Figure 4 Sequence network diagram of a single line-to-ground fault.

Sort by Define		Sort by Number Area/Zone Filter	· Dus Faul	© Single C Line-to	Line-to-Ground	Data Type Sho Current Units			Fault Current Magnitude: 1.978 p.u.
20 (20) 21 (21) 22 (22) 23 (23)	[33 KV] [33 KV]			ault C Double	E Line-to-Ground	Oneline Displa Normal	· ·	C Phase C	Angle: -84.10 deg
24 (24)	[33 KV]	ors Loads Swi	tched Shunts]					
24 (24)	[33 KV]	ors Loads Swi	-	Phase Volt B	Phase Volt C	Phase Ang A	Phase Ang B	Phase Ang C	
24 (24)	[33 KV] ines Generate	Name	tched Shunts		Phase Volt C 1.05770	Phase Ang A -21.36	Phase Ang B -137.24	Phase Ang C 110.83	
24 (24) Jses L	[33 KV] [angund] Lines Generato Number	Name 19	tched Shunts Phase Volt A	Phase Volt B		-	_	-	
24 (24) Jses L 19	[33 KV] ines Generato Number 19	Name 19 20	tched Shunts Phase Volt A 0.50411	Phase Volt B 1.17848	1.05770	-21.36	-137.24	110.83	
24 (24) uses L 19 20	[33 KV] ines Generati Number 19 20	Name 19 20 21	tched Shunts Phase Volt A 0.50411 0.52729	Phase Volt B 1.17848 1.17428	1.05770 1.05324	-21.36 -20.98	-137.24 -136.69	110.83 110.70	
24 (24) uses L 19 20 21	[33 KV] ines Generati Number 19 20 21	Name 19 20 21 22	tched Shunts Phase Volt A 0.50411 0.52729 0.54987	Phase Volt B 1.17848 1.17428 1.16354	1.05770 1.05324 1.04299	-21.36 -20.98 -20.34	-137.24 -136.69 -135.97	110.83 110.70 110.74	
24 (24) uses L 19 20 21 22	[33 KV] For incession Generation Number 19 20 21 22 23	Name 19 20 21 22	tched Shunts Phase Volt A 0.50411 0.52729 0.54987 0.53716	Phase Volt B 1.17848 1.17428 1.16354 1.16720	1.05770 1.05324 1.04299 1.04728	-21.36 -20.98 -20.34 -20.38	-137.24 -136.69 -135.97 -136.17	110.83 110.70 110.74 110.92	

Figure 5 show power world simulators to calculate fault current the type single line to ground.

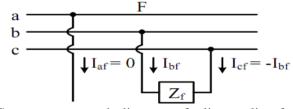


Figure 6 Sequence network diagram of a line-to-line fault

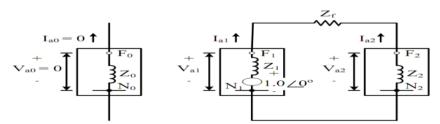


Figure 7 Sequence network diagram of a line-to-line fault.

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ault Dat	ta Fault Options	Maurces	1								
) Sort b	-	Sort by Nu		Fault Locatio	C Single	Line-to-Ground	Data Type Sho Current Units			Fault Curren Magnitude:	.u
) [33 KV]) [33 KV]) [33 KV]		^	C In-Line F	C Doubl	se Balanced e Line-to-Ground	Oneline Displa	C Phase A (C Phase C	Angle:	dec
) [33 KV]			35 _	-		C All Phases	G U Phase B		1 1/0120	,
25 (25)) [33 KV] Lines Generati		<u> </u>	hed Shunts						11/0/20	
25 (25) Buses) [33 KV] Lines Generati Number	Name	<u> </u>	hed Shunts	Phase Volt B	Phase Volt C	Phase Ang A	Phase Ang B	Phase Ang C]	
25 (25) Buses 19) [33 KV] Lines Generati Number 19	Name 19	<u> </u>	hed Shunts Phase Volt A 1.07058	Phase Volt B 0.66851	0.64495	Phase Ang A -15.29	Phase Ang B -160.61	128.56		
25 (25) Buses 19 20	i [33 KV] Lines Generati Number 19 20	Name 19 20	<u> </u>	hed Shunts Phase Volt A 1.07058 1.07069	Phase Volt B 0.66851 0.67871	0.64495 0.65525	Phase Ang A -15.29 -15.07	Phase Ang B -160.61 -159.19	128.56 127.56		
25 (25) Buses 19 20 21	i [33 KV] Lines Generati Number 19 20 21	Name 19 20 21	<u> </u>	hed Shunts Phase Volt A 1.07058 1.07069 1.06480	Phase Volt B 0.66851 0.67871 0.68626	0.64495 0.65525 0.66466	Phase Ang A -15.29 -15.07 -14.67	Phase Ang B -160.61 -159.19 -157.40	128.56 127.56 126.62		
25 (25) Buses 19 20 21 22	[33 KV] Lines Generati Number 19 20 20 21 22	Name 19 20 21 22	<u> </u>	hed Shunts Phase Volt A 1.07058 1.07069 1.06480 1.06625	Phase Volt B 0.66851 0.67871 0.68626 0.68095	0.64495 0.65525 0.66466 0.65939	Phase Ang A -15.29 -15.07 -14.67 -14.68	Phase Ang B -160.61 -159.19 -157.40 -158.08	128.56 127.56 126.62 127.31		
25 (25) Buses 19 20 21 22 23	Image: Second	Name 19 20 21 22 23	<u> </u>	hed Shunts Phase Volt A 1.07058 1.07069 1.06480 1.06625 1.08320	Phase Volt B 0.66851 0.67871 0.68626 0.68095 0.54159	0.64495 0.65525 0.66466 0.65939 0.54159	Phase Ang A -15.29 -15.07 -14.67 -14.68 -15.16	Phase Ang B -160.61 -159.19 -157.40 -158.08 164.84	128.56 127.56 126.62 127.31 164.84		[
25 (25) Buses 19 20 21 22	[33 KV] Lines Generati Number 19 20 21 22 23 24 24	Name 19 20 21 22 23	<u> </u>	hed Shunts Phase Volt A 1.07058 1.07069 1.06480 1.06625	Phase Volt B 0.66851 0.67871 0.68626 0.68095	0.64495 0.65525 0.66466 0.65939	Phase Ang A -15.29 -15.07 -14.67 -14.68	Phase Ang B -160.61 -159.19 -157.40 -158.08	128.56 127.56 126.62 127.31		[

figure 8 show using power world program to calculate current in the type fault line to line

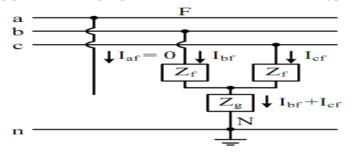


Figure 9 General representation of a double line-to-ground fault.

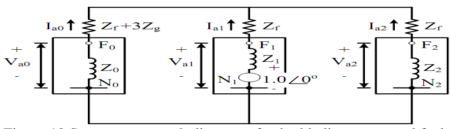


Figure 10 Sequence network diagram of a double line-to-ground fault.

hoose the Faulted B	us	Fault Locatio	Fault Type	e	Data Type Sho	wn		Fault Curre	nt
Sort by Name Define Filter	 Sort by Num Use Area/Zone Fi 	ve busirdui	t C Line-ti		Current Units	C Amps		Magnitude:	p.u
21 (21) [33 KV] 22 (22) [33 KV] 23 (23) [33 KV]		C In-Line F	ault (Double	se Balanced e Line-to-Ground	Oneline Displa Normal All Phases	C Phase A (C Phase C	Angle: 93.55	deg
24 (24) [33 KV] 25 (25) [33 KV]		₹ 35	-		Airridae			,	
25 (25) [33 KV] uses Lines Gen	erators Loads	witched Shunts		Phase Volt C			Phase Ang C	,	
25 (25) [33 KV] uses Lines Gen Number	erators Loads Name	-	Phase Volt B 0.44265	Phase Volt C 0.49103	Phase Ang A -12.50	Phase Ang B -145.01	Phase Ang C 105.85		
25 (25) [33 KV] Jses Lines Gen	Name	witched Shunts	Phase Volt B		Phase Ang A	Phase Ang B	-		
25 (25) [33 KV] uses Lines Gen Number 19	Name 19 19	Witched Shunts Phase Volt A 1.14547	Phase Volt B 0.44265	0.49103	Phase Ang A -12.50	Phase Ang B -145.01	105.85		
25 (25) [33 KV] uses Lines Gen Number 19 20	Name 19 19 20 20	witched Shunts Phase Volt A 1.14547 1.13918	Phase Volt B 0.44265 0.46344	0.49103 0.51303	Phase Ang A -12.50 -12.26	Phase Ang B -145.01 -144.69	105.85 106.20	-	
25 (25) [33 KV] 25 (25) [33 KV] 26 (25) [33 KV] 26 (25) [33 KV] 27 (25) [33 KV] 28 (25) [33 KV] 29 (25) [33 KV] 20 (25) [35] [35] [35] [35] [35] [35] [35] [35]	Name 19 19 20 20 21 21	 Phase Volt A 1.14547 1.3918 1.12654 	Phase Volt B 0.44265 0.46344 0.48397	0.49103 0.51303 0.53529	Phase Ang A -12.50 -12.26 -11.84	Phase Ang B -145.01 -144.69 -143.98	105.85 106.20 106.76		[
25 (25) [33 KV] 25 (25) [53 IAV] 26 (25) [53 IAV] 26 (25) [53 IAV] 27 (55) [53 IAV] 28 (55) [53 IAV] 29 (55) [53 IAV] 20 (55) [53 IAV] 20 (55) [53 IAV] 20 (55) [53 IAV] 20 (55) [53 IAV] 21 (55) [53 IAV] 22 (55) [53 IAV] 23 IAV] 20 (55) [53 IAV]	Name 19 19 20 20 21 21 22 22	witched Shunts Phase Volt A 1.14547 1.13918 1.12654 1.13167	Phase Volt B 0.44265 0.46344 0.48397 0.47275	0.49103 0.51303 0.53529 0.52296	Phase Ang A -12.50 -12.26 -11.84 -11.88	Phase Ang B -145.01 -144.69 -143.98 -144.01	105.85 106.20 106.76 106.73		

figure 11 show using power world program to calculate current in the type fault double line

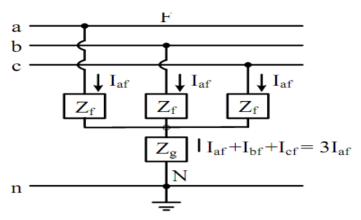


Figure 12 General representation of a balanced three-phase fault

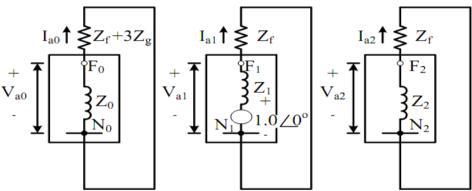


Figure 13 Sequence network diagram of a balanced three-phase fault

	Fault Options									
hoose th	he Faulted Bus		Fault Locatio			Data Type Sho			Fault Currer	nt
Sort by Define		Sort by Number Area/Zone Filter	 Bus Fault 	C Line-to		Current Units	C Amps		Magnitude:	p.u
21 (21)			O In-Line F	ault	se Balanced e Line-to-Ground	Oneline Displa		C Phase C	, Angle:	
22 (22) 23 (23)			Location ^o	9/6					-80.25	deg
24 (24) 25 (25)	[33 KV] [33 KV]	s Loads Swit	→ <u>35</u>			C All Phases	s C Phase B		[-80.25	uey
24 (24) 25 (25)	[33 KV] [33 KV]	s Loads Swit Name	→ <u>35</u>		Phase Volt C	C All Phases	Phase Ang B	Phase Ang C	-00.25	ucy
24 (24) 25 (25)	[33 KV] [33 KV] Lines Generators	Name	ched Shunts	1	Phase Volt C 0.43956			Phase Ang C 102.53]	
24 (24) 25 (25) uses	[33 KV] [33 KV] Lines Generators Number	Name 9	tched Shunts Phase Volt A	Phase Volt B		Phase Ang A	Phase Ang B			
24 (24) 25 (25) uses Li 19	[33 KV] [33 KV] Lines Generators Number 19 1 ¹	Name 9	The set of	Phase Volt B 0.43956	0.43956	Phase Ang A -17.47	Phase Ang B -137.47	102.53		
24 (24) 25 (25) uses L 19 20	[33 KV] [33 KV] Lines Generators Number 19 1 20 2	Name 9 0 1	35 cched Shunts Phase Volt A 0.43956 0.45958	Phase Volt B 0.43956 0.45958	0.43956 0.45958	Phase Ang A -17.47 -17.17	Phase Ang B -137.47 -137.17	102.53 102.83		
24 (24) 25 (25) uses L 19 20 21	[33 KV] [33 KV] Football Number 19 1/ 20 2/ 21 2	Name 9 0 1 2	* * * * * * * * * * * * * *	Phase Volt B 0.43956 0.45958 0.48016	0.43956 0.45958 0.48016	Phase Ang A -17.47 -17.17 -16.56	Phase Ang B -137.47 -137.17 -136.56	102.53 102.83 103.44		
24 (24) 25 (25) uses L 19 20 21 22	[33 KV] [33 KV] Lines Generator: Number 19 1 20 2 21 2 22 2 22 2	Name 9 0 1 2 3	* * * * * * * * * * * * * * * * * * *	Phase Volt B 0.43956 0.45958 0.48016 0.46908	0.43956 0.45958 0.48016 0.46908	Phase Ang A -17.47 -17.17 -16.56 -16.59	Phase Ang B -137.47 -137.17 -136.56 -136.59	102.53 102.83 103.44 103.41		

figure 14 show using power world program to calculate current in the type fault three phase

تحليل دوائر القصر الكهربائي في شبكات أنظمة القدرة الكهربائية

الخلاصة

لضمان وصول القدرة الكهربائية للمستهلك بصورة مستمرة وبدون انقطاع مع موثوقية واستقرارية تجعل من خدمات القدرة هي الأفضل , في هذا البحث دراسة تحليلية لجميع انواع دوائر القصر (faults). تعتبر عملية التحليل الرياضي لدوائر القصر في شبكات أنظمة القدرة الكهربائية من اهم واصعب المهام في انظمة القدرة. ولهذا فان دراسة واكتشاف العطل يعتبر من الضروريات للتأكد من ان القدرة مستقرة وموثوقة لاستخدام المستهلك. اعتماد قوة العطل الكهربائي على على على على على على معلية التحليل الرياضي لدوائر القصر في شبكات أنظمة القدرة الكهربائية من اهم واصعب المهام في انظمة القدرة. ولهذا فان دراسة واكتشاف العطل يعتبر من الضروريات للتأكد من ان القدرة مستقرة وموثوقة لاستخدام المستهلك. اعتماد قوة العطل الكهربائي على على موقعه بالنسبة للشبكة مما يجعل مسار تيار العطل يحدد من مستوى الفولتية وقيمة الممانعة بالنسبة للخط الذي حدث فيه العطل.في هذا البحث تحليل لسلوك النظام الكهربائي تحت تاثير عدة انواع من العطل الكهربائي. (IEEE30-bus) الكهربائي. (IEEE30-bus) الكهربائي. الالتائية المستحصلة تمت مناقشتها في متن هذا البحث.