

ANEXO UNIDAD I DE LA CENTRAL TERMOELÉCTRICA DE PAIPA

GENERADOR

Generador sincrónico			
Parámetro	Variabl e	Unidad	VALOR
Denominación	-	-	S16999
Fabricante	-	-	Alstom
Tipo	-	-	JISALT 250
Rated power	Sn	[MVA]	50
Rated generator voltage	Un	[V]	13800
Frequency grid	fn	[Hz]	60
Armature resistance	Ra	[ohm]	0.0209
Leakage reactance	Xl	[p.u.]	0.101
Unsaturated d axis synchronous reactance	Xd	[p.u.]	2.545
Unsaturated d axis transient reactance	Xpd	[p.u.]	0.3434
Unsaturated d axis subtransient reactance	Xppd	[p.u.]	0.2317
Unsaturated q axis synchronous reactance	Xq	[p.u.]	2.468
Unsaturated q axis subtransient reactance	Xppq	[p.u.]	0.2192
d axis transient short circuit time constant	Tpd	[s]	0.83
d axis subtransient short circuit time constant	Tppd	[s]	0.048
q axis transient short circuit time constant	Tpq	[s]	0.08
q axis subtransient short circuit time constant	Tppq	[s]	0.0671
Inertia constant	H	[MWs/MVA]	1.03
Field current (no load)	ifbase	[Adc]	14

TABLA 4. PARÁMETROS DEL AVR.

VARIABLE	UNIDAD	VALOR
Pg_Comp	[p.u.]	0.0000
Qg_Comp	[p.u.]	0.0000
K1	[p.u.]	1.0000
T1	[p.u.]	0.0100
Kp_avr	[p.u.]	3.2000
Ki_avr	[p.u.]	0.8000
Kd_avr	[p.u.]	1.0000
N_avr	[p.u.]	12.5000
max_avr	[p.u.]	4.0000
min_avr	[p.u.]	0.0000

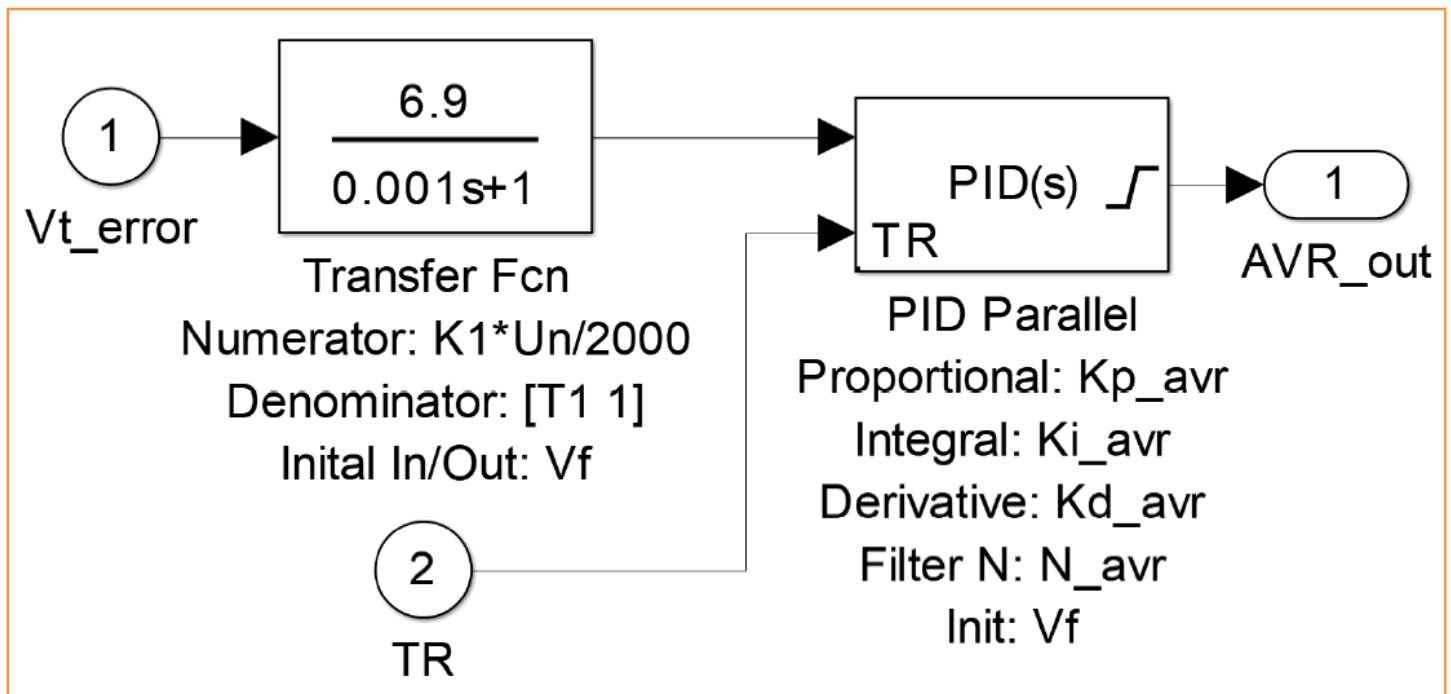


FIGURA 6. MODELO AVR IMPLEMENTADO

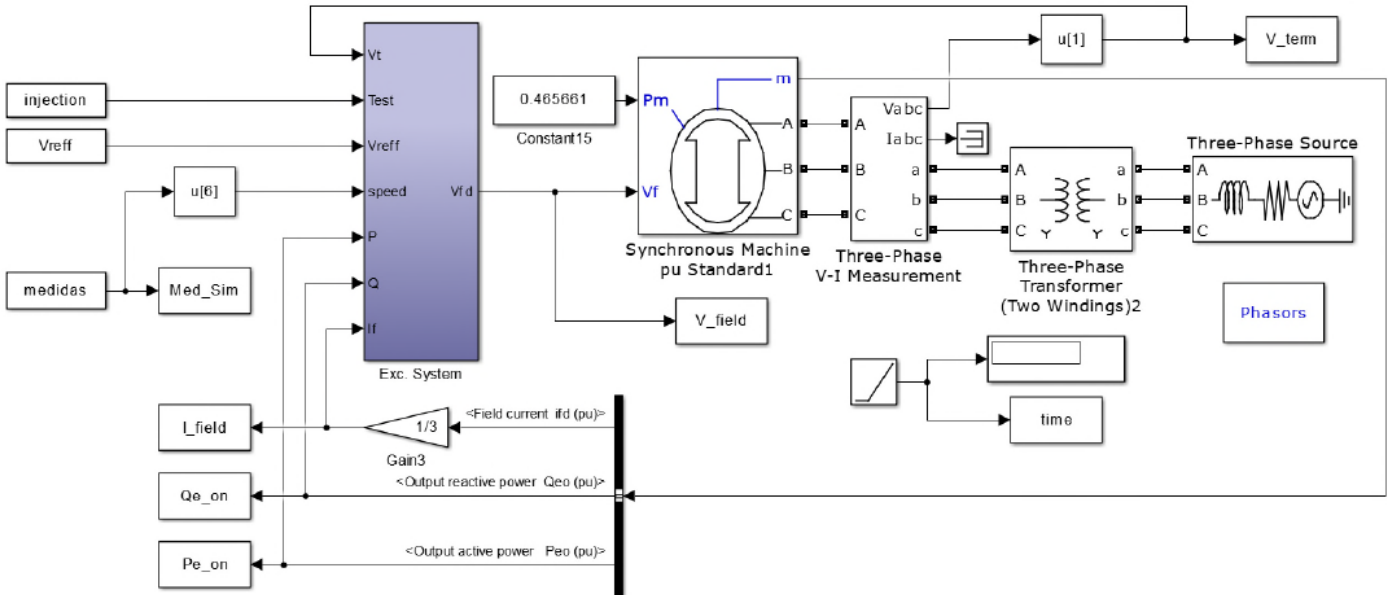


FIGURA 15. MODELO DEL GENERADOR Y EL SISTEMA DE EXCITACIÓN

MODELO SISTEMA DE EXCITACIÓN

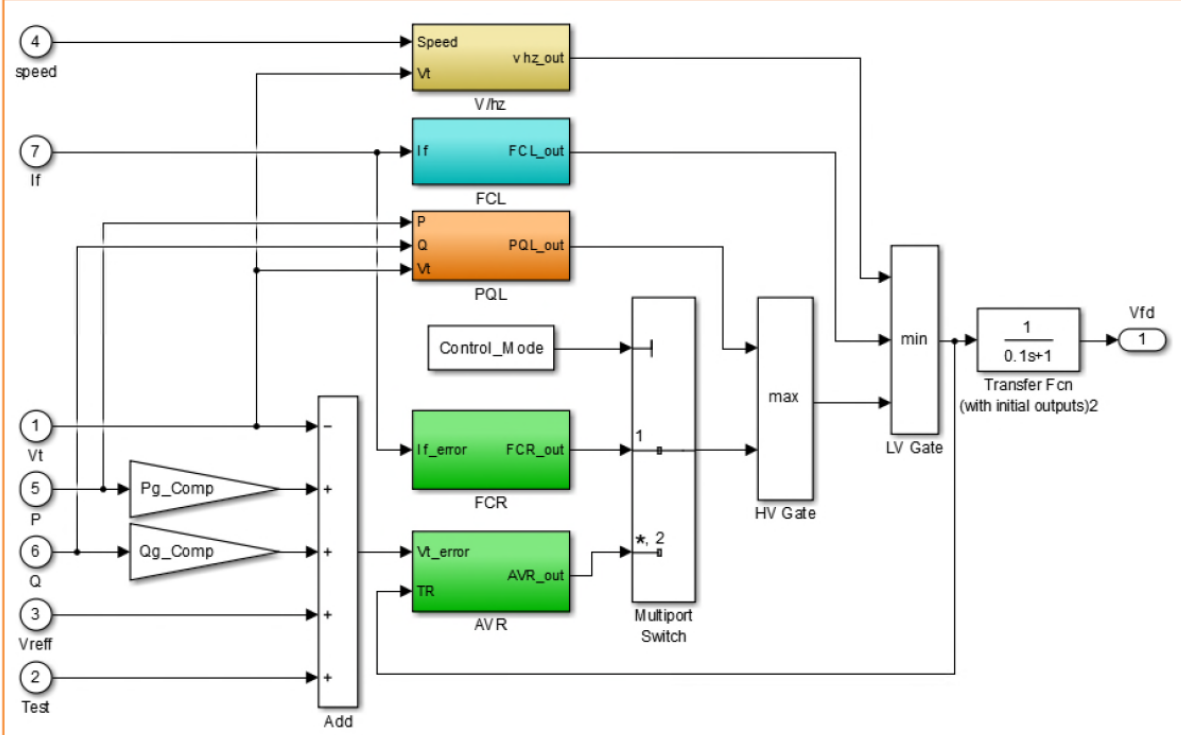


FIGURA 4. MODELO SISTEMA EXCITACIÓN

FCR

TABLA 5. PARÁMETROS DEL FCR.

VARIABLE	UNIDAD	VALOR
Kp_fcr	[p.u.]	4.0000
Ki_fcr	[p.u.]	0.5700
max_fcr	[p.u.]	5.0000

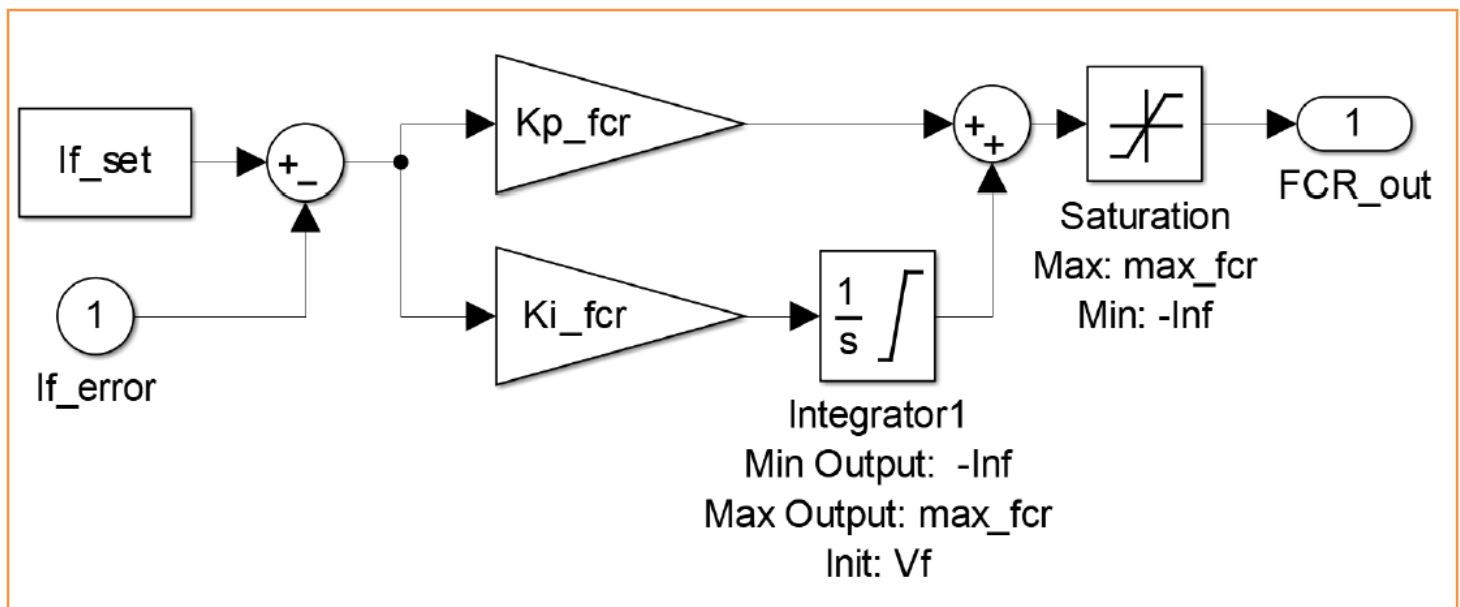


FIGURA 8. MODELO FCR IMPLEMENTADO

FCL

TABLA 6. PARÁMETROS FCL.

VARIABLE	UNIDAD	VALOR
fcl_onoff	[p.u.]	1.0000
If_max	[p.u.]	5.037
If_th	[p.u.]	3.8
Tceling	[p.u.]	20.0000
I2tmax	[p.u.]	6000.0000
Kp_fcl	[p.u.]	4.0000
Ki_fcl	[p.u.]	0.5700
max_fcl	[p.u.]	0.0000
min_fcl	[p.u.]	-4.0000
fcl_Bias	[p.u.]	4.0000

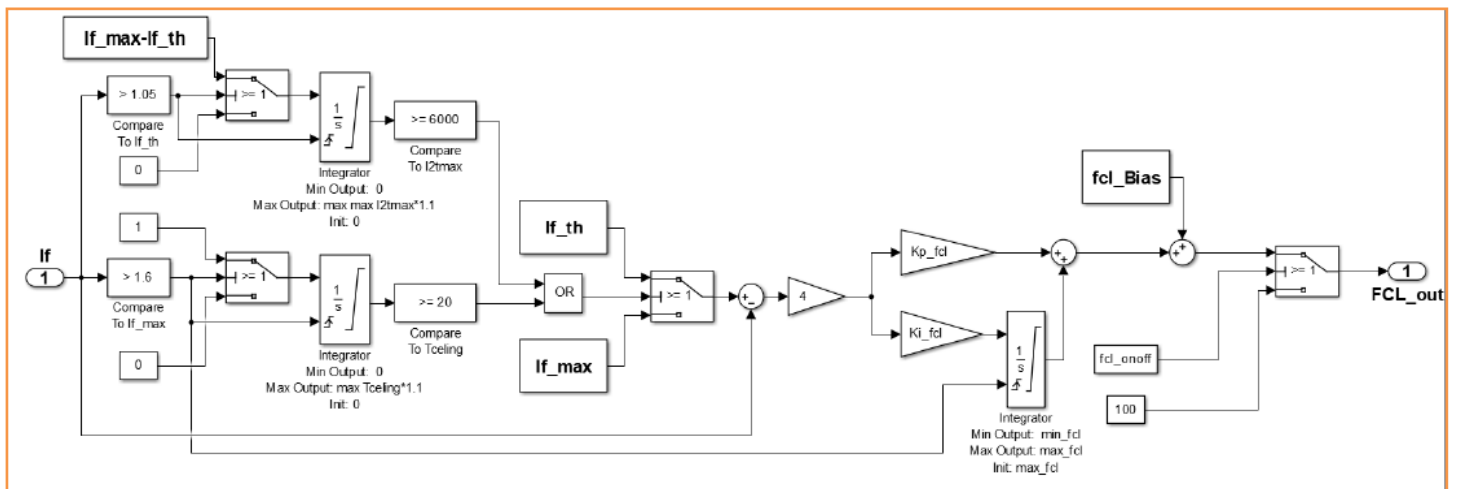


FIGURA 10. MODELO DEL LIMITADOR FCL IMPLEMENTADO

PQL

TABLA 7. PARÁMETROS PQL.

VARIABLE	UNIDAD	VALOR
pql_onoff	[p.u.]	1.0000
Xd_contr	[p.u.]	2.5540
Kp_pql	[p.u.]	4.0000
Ki_pql	[p.u.]	1.0000
max_pql	[p.u.]	4.0000
min_pql	[p.u.]	0.0000
PQX.X1	[p.u.]	0.0000
PQX.X2	[p.u.]	0.1400
PQX.X3	[p.u.]	0.4000
PQX.X4	[p.u.]	0.6000
PQX.X5	[p.u.]	0.7800
PQX.X6	[p.u.]	0.9800
PQY.Y1	[p.u.]	-0.3900
PQY.Y2	[p.u.]	-0.3400
PQY.Y3	[p.u.]	-0.24
PQY.Y4	[p.u.]	-0.16
PQY.Y5	[p.u.]	-0.1
PQY.Y6	[p.u.]	-0.0400

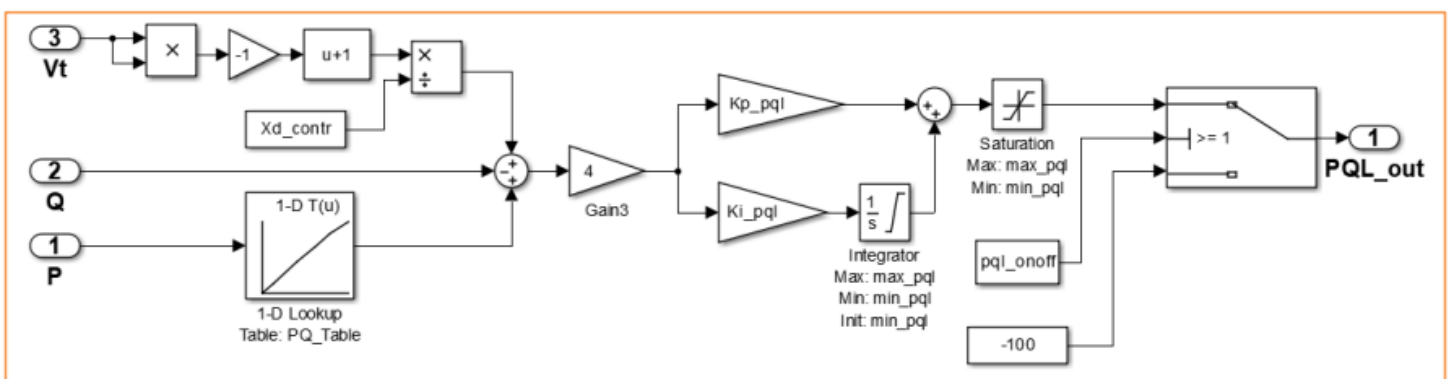


FIGURA 12. MODELO DEL LIMITADOR PQL IMPLEMENTADO

V/Hz

TABLA 8. PARÁMETROS V/Hz.

VARIABLE	UNIDAD	VALOR
vhzl_onoff	[p.u.]	1.0000
vhzl_ref	[p.u.]	1.0550
Kp_vhzl	[p.u.]	3.2000
Ki_vhzl	[p.u.]	0.8000
max_vhzl	[p.u.]	0.0000
min_vhzl	[p.u.]	-2.0000
vhzl_Bias	[p.u.]	2.0000

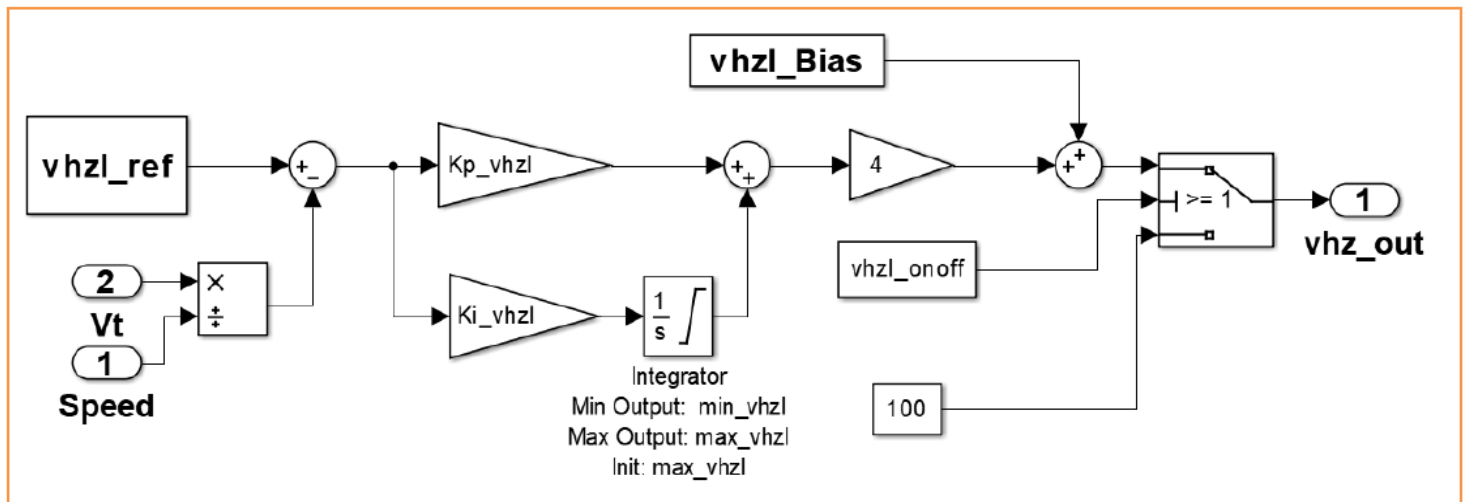


FIGURA 14. MODELO DEL LIMITADOR V/Hz IMPLEMENTADO.

REGULADOR DE VELOCIDAD – POTENCIA

TABLA 16. PARÁMETROS DEL REGULADOR DE VELOCIDAD POTENCIA.

PARÁMETROS	VARIABLE	VALOR
Potencia nominal	Pnom	45
flujo nominal	PresNom	64
Salida maxima Integrador	Intmax	2
banda muerta para estatismo	SDB	0.0005
Ganancia de estatismo	Droop	0.0469
maximo aporte de estatismo	t_integer	4
Tiempo válvula 1	Ty1	2.4
Tiempo válvula 2	Ty2	0.025

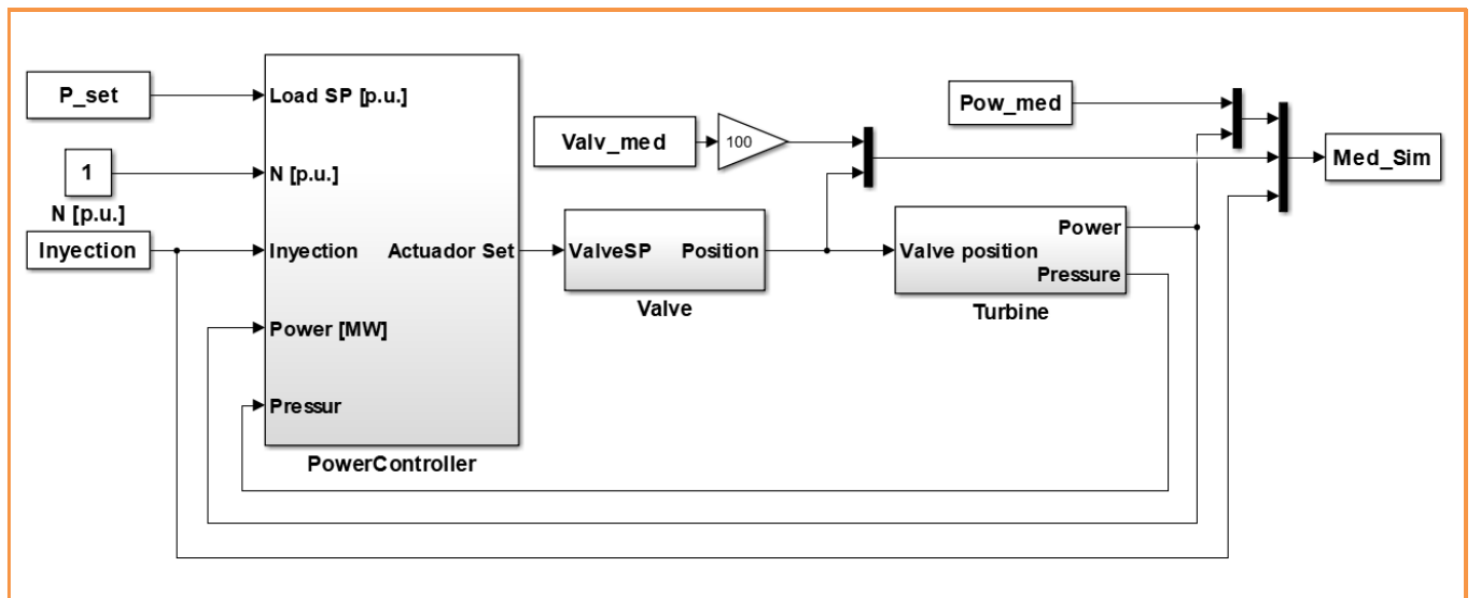


FIGURA 31. MODELO GENERAL CONTROL TURBINA – MATLAB

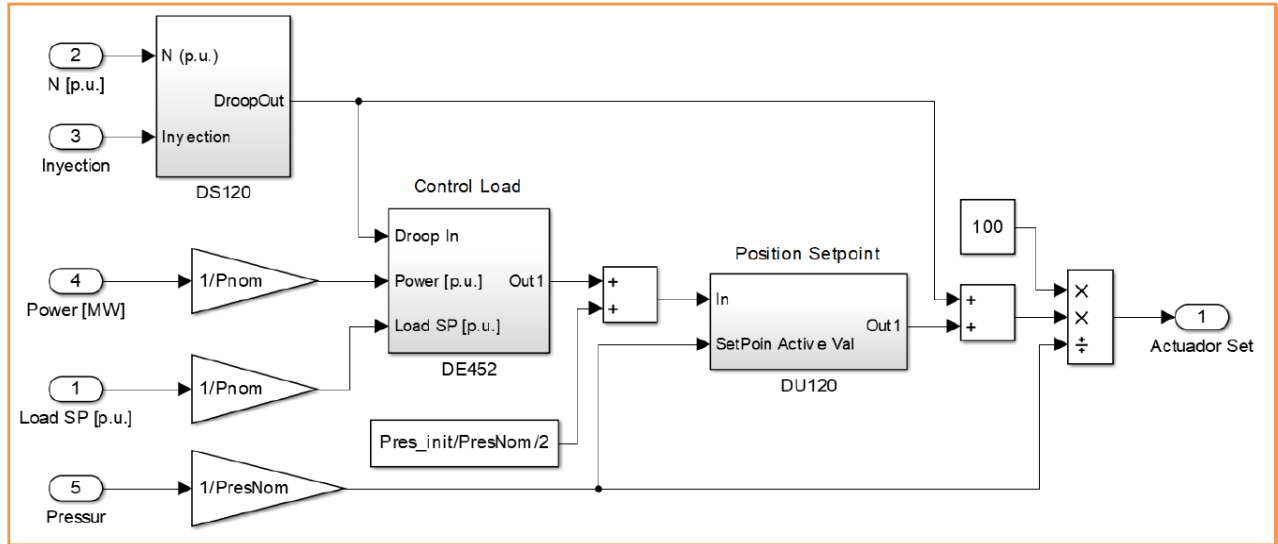


FIGURA 32. MODELO " POWERCONTROLLER "

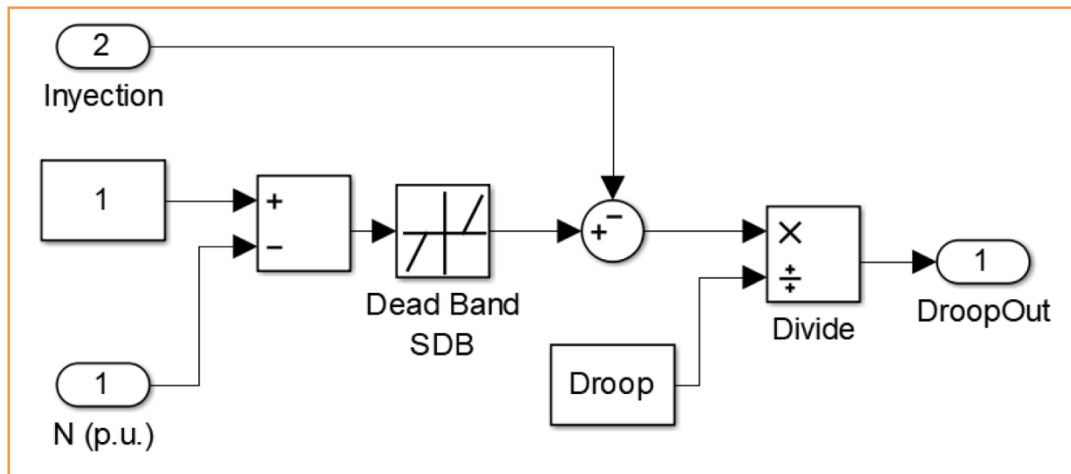


FIGURA 33. MODELO " DS120"

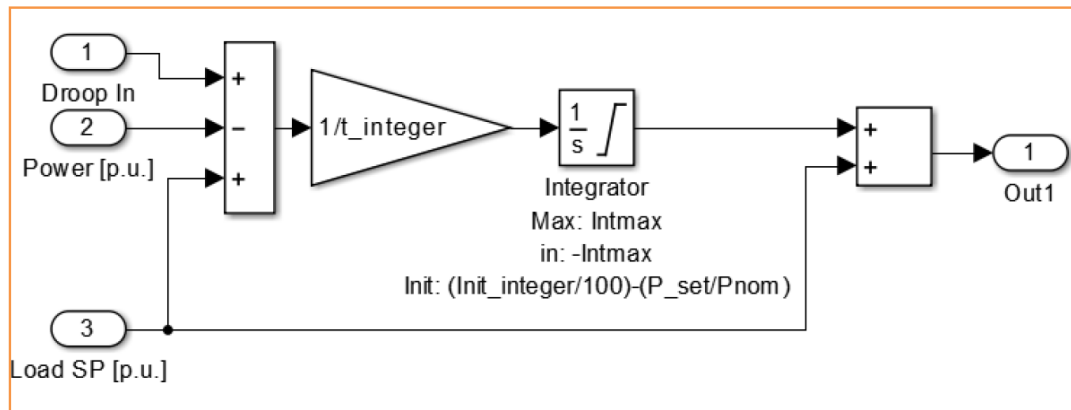


FIGURA 34. MODELO DE452

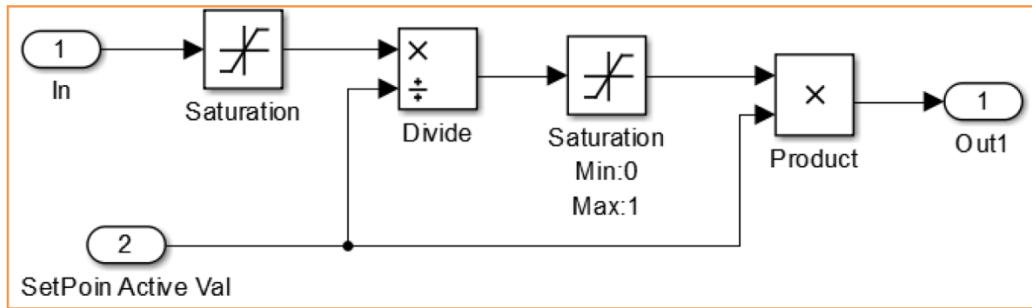


FIGURA 35. MODELO DU120

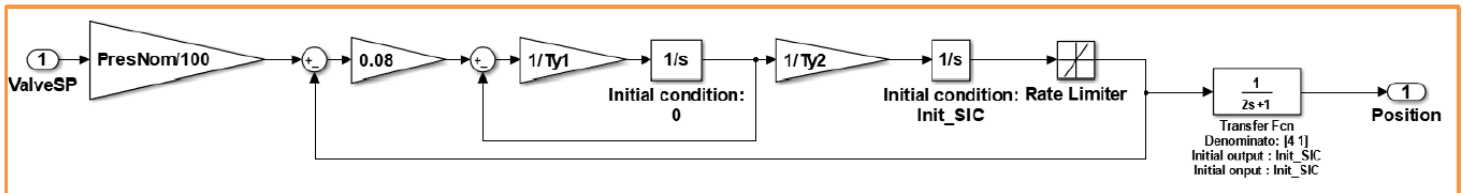


FIGURA 36. MODELO VÁLVULA

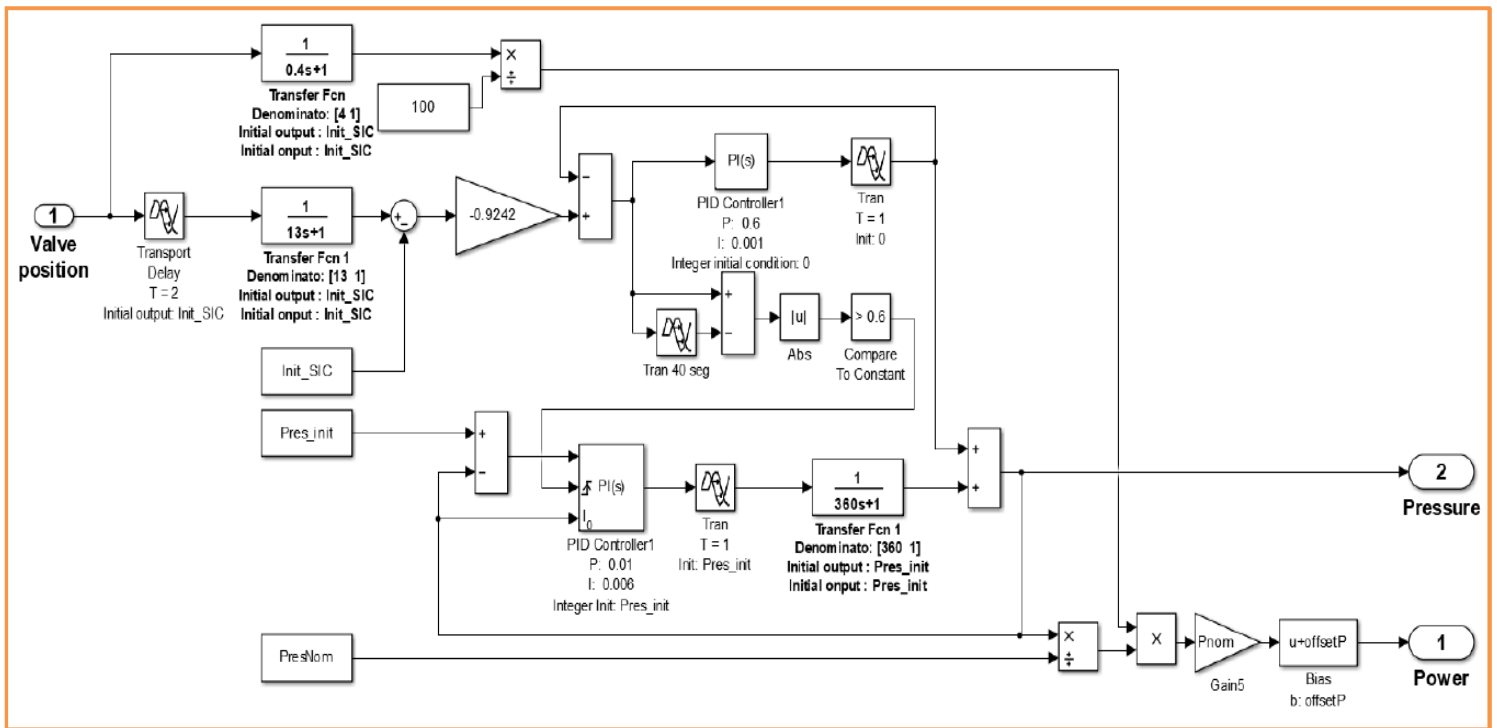


FIGURA 37. MODELO TURBINA

Curva de saturación del Generador

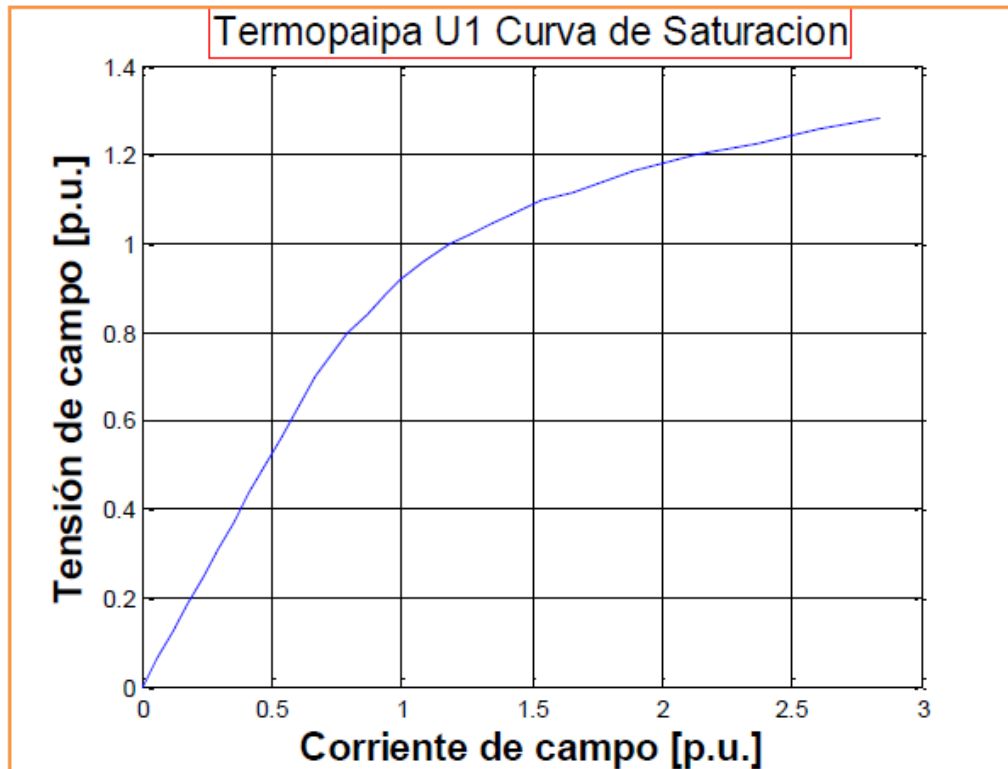


Figura 17. Curva de característica de saturación.



Consejo Nacional de Operación

TABLA 11. VALORES DE CURVA DE SATURACIÓN.

Corriente de campo [p.u]	Tensión de terminales [p.u]
0.0000	0.0000
0.0500	0.0622
0.1000	0.1244
0.1500	0.1867
0.2000	0.2489
0.2500	0.3111
0.3000	0.3733
0.3500	0.4356
0.4000	0.4978
0.4500	0.5600
0.5625	0.7000
0.6000	0.7330
0.6660	0.8000
0.7330	0.8400
0.8000	0.8900
0.8400	0.9160
0.9160	0.9580
1.0000	1.0000
1.0660	1.0200
1.1330	1.0450
1.2000	1.0660
1.3000	1.1000
1.4000	1.1160
1.6000	1.1640
1.8000	1.2000
2.0000	1.2240
2.2000	1.2580
2.4000	1.2830