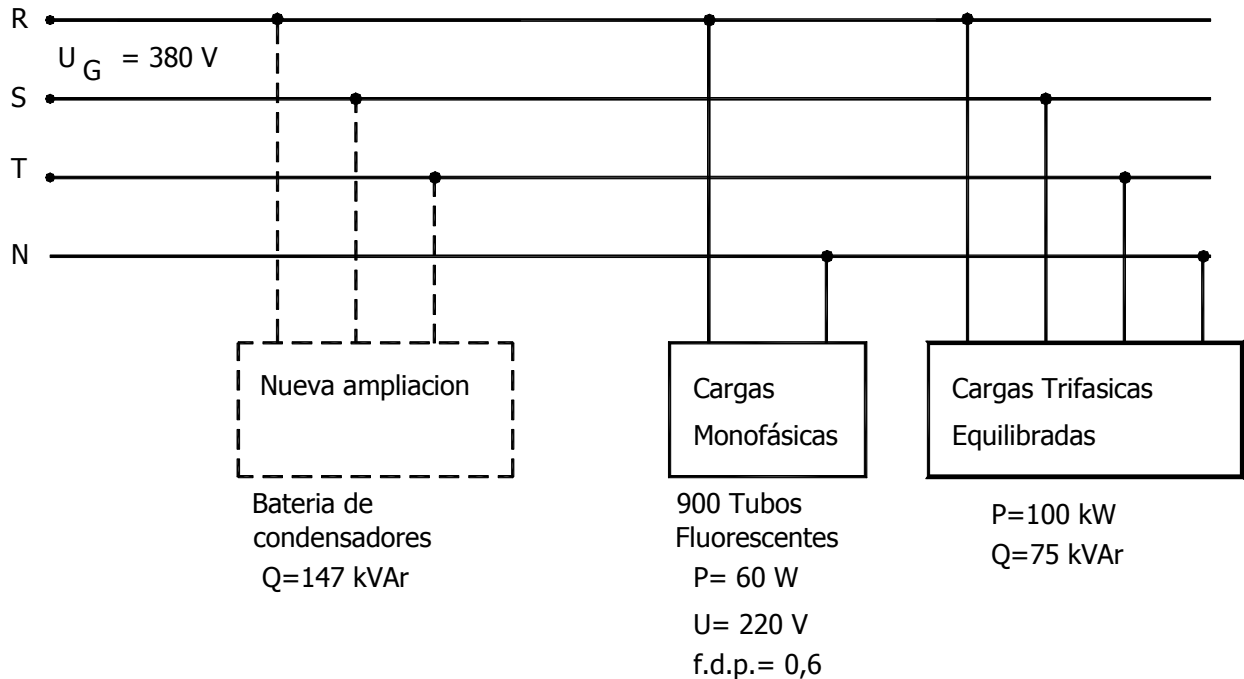


Problema:

La industria “El Desastre, S.A.” continuando su mejora de la instalación eléctrica, ha realizado una nueva ampliación siguiendo el diseño de la figura adjunta. Se pide:



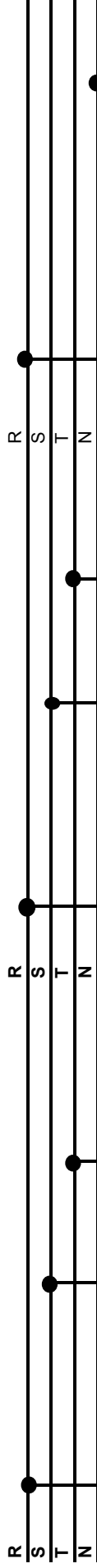
Se pide:

- 1.- Intensidades de línea.
- 2.- Diseñar un equipo de medida de la potencia activa consumida de la red y dar sus lecturas.
- 3.- ¿Cual sería tu propuesta de mejora de la instalación?. ¿Que beneficios tendría tu mejora sobre la existente?. ¿Serviría la batería de condensadores instalada?.

**ELECTROTECNIA (MONTES Y AGRÓNOMOS). 3/09/03. ETSIAM.**

Tubos fluorescentes

UL = 380 V



380 V

**P = 0 W**  
**Q = -147000 Var**  
**UL = 380 V**

$\varphi = -1,571 \text{ rad}$   
 $\varphi = -90^\circ$   
**IL = 223,34 A**

Carga en: Estrella

Carga en: Triángulo  
**UF = 219,3931023 V**  
**IF = 223,3433936 A**  
**R = 0 Ω**  
**X = -0,98231293 Ω**  
**Z = 0,982312925 Ω**

**I1 = 223,343**  $\underline{180,00^\circ} = -223,34 + 0,00 \text{ j}$   
**I2 = 223,343**  $\underline{60,00^\circ} = 111,67 + 193,42 \text{ j}$   
**I3 = 223,343**  $\underline{-60,00^\circ} = 111,67 + -193,42 \text{ j}$   
**ZE = 0,982**  $\underline{-90,00^\circ} = 0 + -0,9823129 \text{ j}$   
**ZT = 2,947**  $\underline{-90,00^\circ} = 0 + -2,9469388 \text{ j}$   
**S = 147000,000**  $\underline{-90,00^\circ} = 0 + -147000 \text{ j}$

380 V

**P = 100000 W**  
**fdp = 0,8**  
**UL = 380 V**

$\varphi = 0,6435 \text{ rad}$   
 $\varphi = 36,87^\circ$   
**IL = 189,92 A**

Carga en: Estrella

Carga en: Triángulo  
**UF = 219,393102 V**  
**IF = 189,917852 A**  
**R = 0,92416 Ω**  
**X = 0,69312 Ω**  
**Z = 1,1552 Ω**

**I1 = 189,918**  $\underline{53,13^\circ} = 113,95 + 151,93 \text{ j}$   
**I2 = 189,918**  $\underline{-66,87^\circ} = 74,60 + -174,65 \text{ j}$   
**I3 = 189,918**  $\underline{-186,87^\circ} = -188,55 + 22,72 \text{ j}$   
**ZE = 1,155**  $\underline{36,87^\circ} = 0,9242 + 0,69312 \text{ j}$   
**ZT = 3,466**  $\underline{36,87^\circ} = 2,7725 + 2,07936 \text{ j}$   
**S = 125000,000**  $\underline{36,87^\circ} = 100000 + 75000 \text{ j}$

219,3931 V

**P = 54000 W**  
**fdp = 0,6**  
**UL = 219,393102 V**

$\varphi = 0,927 \text{ rad}$   
 $\varphi = 53,13^\circ$   
**S = 90000 VA**

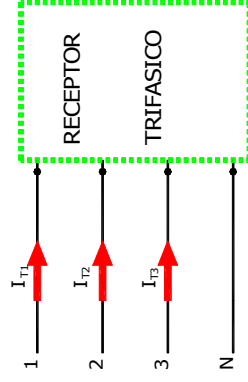
U = 219,393102  $\underline{90^\circ} = 0,00 + 219,39$

**IF = 410,22256 A**  
**R = 0,32088889 Ω**  
**X = 0,42785185 Ω**  
**Z = 0,53481481 Ω**

**I1 = 410,22256**  $\underline{36,87^\circ} = 328,2 + 246,1 \text{ j}$   
**I2 = 0**  $\underline{0^\circ} = 0 + 0 \text{ j}$   
**I3 = 0**  $\underline{0^\circ} = 0 + 0 \text{ j}$   
**In = 410,22256**  $\underline{-143,1^\circ} = -328,2 + -246,1 \text{ j}$   
**Z = 0,535**  $\underline{53,13^\circ} = 0,321 + 0,428 \text{ j}$   
**S = 90000,000**  $\underline{53,13^\circ} = 54000 + 72000 \text{ j}$

**Total: Carga 1 + Carga 2 + Carga 3**

**IT1 = 454,230**  $\underline{61,21^\circ} = 218,79 + 398,07 \text{ j}$   
**IT2 = 187,219**  $\underline{5,75^\circ} = 186,28 + 18,77 \text{ j}$   
**IT3 = 187,219**  $\underline{245,75^\circ} = -76,88 + -170,70 \text{ j}$



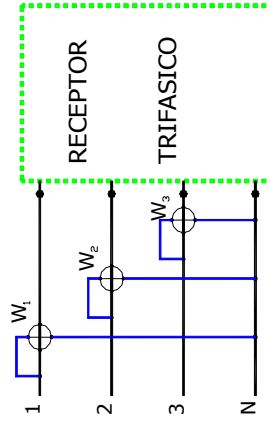
**PT = 154000,00 W**  
**QT = 0,00 Var**  
**ST = 154000 VA**

**fdp = 1**  
**φ = 0,00°**  
**IL = 233,97879 A**

??

**Z1 = 0,483**  $\underline{28,79^\circ}$   
**Z2 = 1,172**  $\underline{-35,75^\circ}$   
**Z3 = 1,172**  $\underline{-35,75^\circ}$   
**fdp1 = 0,8763571**  
**fdp2 = 0,8115343**  
**fdp3 = 0,8115343**

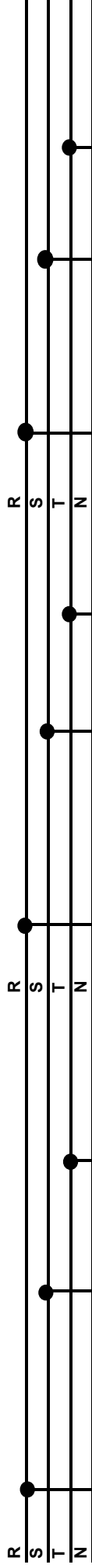
**W1 = 87333,3333 W**  
**W2 = 33333,3333 W**  
**W3 = 33333,3333 W**



$P = W_1 + W_2 + W_3$

UL = 380 V

Tubos fluorescentes



380 V

**P = 0 W**  
**Q = -147000 VAR**  
**UL = 380 V**  
**C. Capacitiva**

$\phi = -1,5708 \text{ rad}$   
 $\phi = -90^\circ$   
**IL = 223,3434 A**

Carga en: Estrella  
 Carga en: Triángulo  
 UF = 219,393102 V  
 IF = 223,343394 A  
 R = 0  $\Omega$   
 X = -0,98231293  $\Omega$   
 Z = 0,98231293  $\Omega$

I1 = 223,34 180,00° = -223,34 + 0,00 j  
 I2 = 223,34 60,00° = 111,67 + 193,42 j  
 I3 = 223,34 -60,00° = 111,67 + -193,42 j  
 ZE = 0,98 -90,00° = 0 + -0,982313 j  
 ZT = 2,95 -90,00° = 0 + -2,946939 j  
 S = 147000,00 -90,00° = 0 + -147000 j

380 V

**P = 100000 W**  
**fdp = 0,8**  
**UL = 380 V**

$\phi = 0,6435 \text{ rad}$   
 $\phi = 36,87^\circ$   
**IL = 189,92 A**

Carga en: Estrella  
 Carga en: Triángulo  
 UF = 219,393102 V  
 IF = 189,917852 A  
 R = 0,92416  $\Omega$   
 X = 0,69312  $\Omega$   
 Z = 1,1552  $\Omega$

I1 = 189,92 53,13° = 113,95 + 151,93 j  
 I2 = 189,92 -66,87° = 74,60 + -174,65 j  
 I3 = 189,92 -186,87° = -188,55 + 22,72 j  
 ZE = 1,16 36,87° = 0,9242 + 0,69312 j  
 ZT = 3,47 36,87° = 2,7725 + 2,07936 j  
 S = 125000,00 36,87° = 100000 + 75000 j

380 V

**P = 54000 W**  
**fdp = 0,6**  
**UL = 380 V**

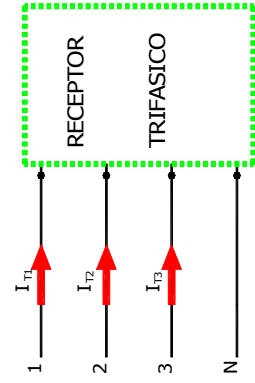
$\phi = 0,9273 \text{ rad}$   
 $\phi = 53,13^\circ$   
**IL = 136,74 A**

Carga en: Estrella  
 Carga en: Triángulo  
 UF = 219,393102 V  
 IF = 136,740853 A  
 R = 0,96266667  $\Omega$   
 X = 1,28355556  $\Omega$   
 Z = 1,60444444  $\Omega$

I1 = 136,74 36,87° = 109,39 + 82,04 j  
 I2 = 136,74 -83,13° = 16,36 + -135,76 j  
 I3 = 136,74 -203,13° = -125,75 + 53,71 j  
 ZE = 1,60 53,13° = 0,9627 + 1,2836 j  
 ZT = 4,81 53,13° = 2,888 + 3,8507 j  
 S = 90000,00 53,13° = 54000 + 72000 j

**Total: Carga 1 + Carga 2 + Carga 3**

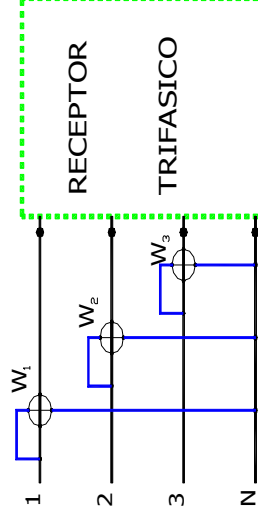
IT1 = 233,979 90,00° = 0,00 + 233,98 j  
 IT2 = 233,979 330,00° = 202,63 + -116,99 j  
 IT3 = 233,979 210,00° = -202,63 + -116,99 j



PT = 154000,00 W  
 QT = 0,00 Var  
 ST = 154000 VA

fdp = 1  
 $\phi = 0,00^\circ$   
 IL = 233,9788 A

W1 = 51333,3333 W  
 W2 = 51333,3333 W  
 W3 = 51333,3333 W



$P = W_1 + W_2 + W_3$