



Bahía Blanca. PETROBRAS. 9.500 bpd

Campana. ESSO. 84.500 bpd.

Campo Durán (Salta). PETROBRAS. 32.000 bpd.

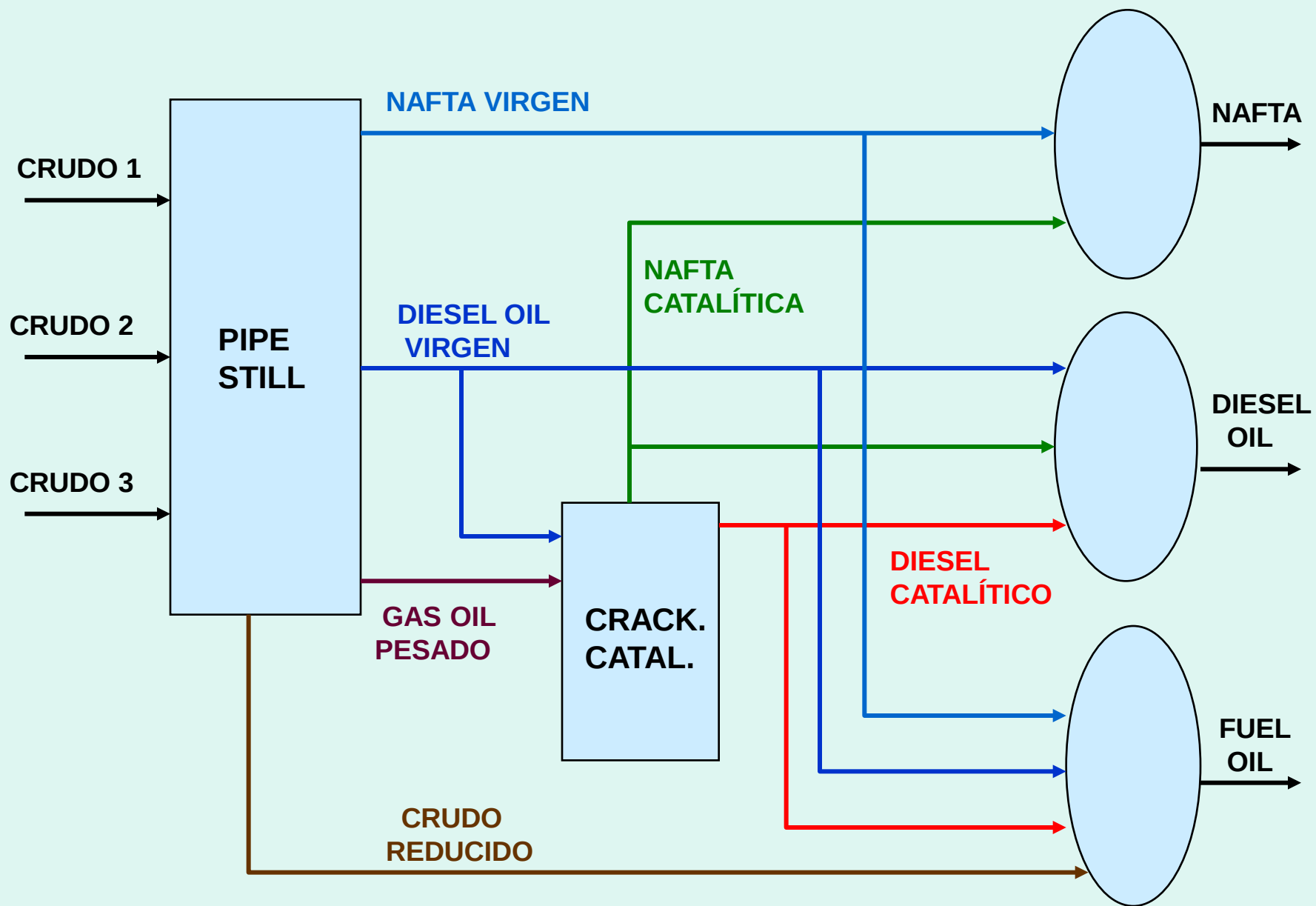
Dock Sud. SHELL. 110.000 bpd.

La Plata. YPF. 189.000 bpd.

Luján de Cuyo (Mendoza). YPF. 105.500 bpd.

Plaza Huincul (Neuquén). PETROLERA ARGENTINA. 37.190 bpd

San Lorenzo (Santa Fe) Cristóbal López (ex-Petrobras). 38.000 bpd



| <b>CAPACIDADES DE PLANTAS</b> | <b>MBbl/D</b> |
|-------------------------------|---------------|
| <b>Pipe Still (PS)</b>        | <b>10,00</b>  |
| <b>Cat Cracking (CC)</b>      | <b>6,50</b>   |

| <b>DISPONIBILIDAD DE CRUDOS</b> | <b>MBbl/D</b> |
|---------------------------------|---------------|
| <b>Crudo 1 (CR1)</b>            | <b>6,00</b>   |
| <b>Crudo 2 (CR2)</b>            | <b>6,00</b>   |
| <b>Crudo 3 (CR3)</b>            | <b>6,00</b>   |

| <b>RENDIMIENTO DE CRUDOS</b>   | <b>CR1</b>  | <b>CR2</b>  | <b>CR3</b>  |
|--------------------------------|-------------|-------------|-------------|
| <b>Nafta Virgen (NFV)</b>      | <b>0,23</b> | <b>0,15</b> | <b>0,03</b> |
| <b>Diesel Oil Virgen (DOV)</b> | <b>0,28</b> | <b>0,31</b> | <b>0,27</b> |
| <b>Gas Oil Pesado (GOP)</b>    | <b>0,40</b> | <b>0,35</b> | <b>0,27</b> |
| <b>Crudo Reducido (CRR)</b>    | <b>0,08</b> | <b>0,18</b> | <b>0,42</b> |
| <b>TOTAL</b>                   | <b>0,99</b> | <b>0,99</b> | <b>0,99</b> |

| <b>RENDIMIENTO DEL CRACKING</b>    | <b>DOV</b>  | <b>GOP</b>  |
|------------------------------------|-------------|-------------|
| <b>Nafta Catalítica (NFC)</b>      | <b>0,25</b> | <b>0,55</b> |
| <b>Diesel Oil Catalítico (DOC)</b> | <b>0,85</b> | <b>0,60</b> |
| <b>TOTAL</b>                       | <b>1,10</b> | <b>1,15</b> |

| <b>REQUERIMIENTOS MAXIMOS<br/>DE PRODUCTOS</b> | <b>MBbl/D</b>            |
|------------------------------------------------|--------------------------|
| <b>Nafta Comercial (NF)</b>                    | <b>4,00</b>              |
| <b>Diesel Oil Comercial (DO)</b>               | <b>4,00</b>              |
| <b>Fuel Oil Comercial (FO)</b>                 | <b>Sin restricciones</b> |

| <b>ESPECIFICACIONES COMERCIALES<br/>DE LA NAFTA</b> | <b>Nro. de<br/>Octano</b> |
|-----------------------------------------------------|---------------------------|
| <b>Número de Octanos Mínimo de la nafta</b>         | <b>80</b>                 |
| <b>Nafta Vírgen (NFV)</b>                           | <b>59</b>                 |
| <b>Nafta Catalítica (NFC)</b>                       | <b>98</b>                 |

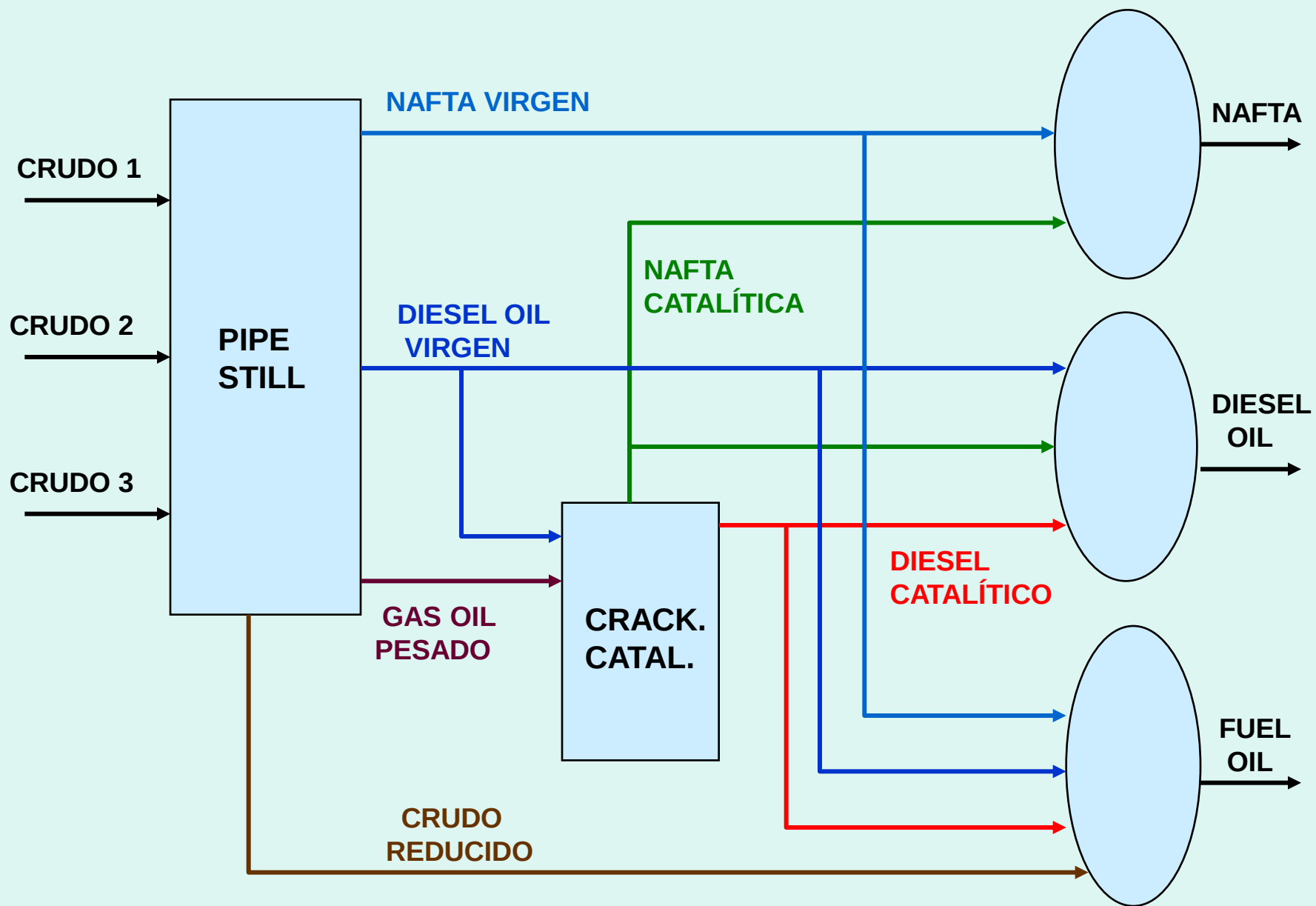
| <b>ESPECIFICACIONES COMERCIALES<br/>DEL DIESEL OIL</b>                     | <b>%</b>  |
|----------------------------------------------------------------------------|-----------|
| <b>Cantidad máxima de Nafta Catalítica<br/>(limitación de Flash Point)</b> | <b>10</b> |

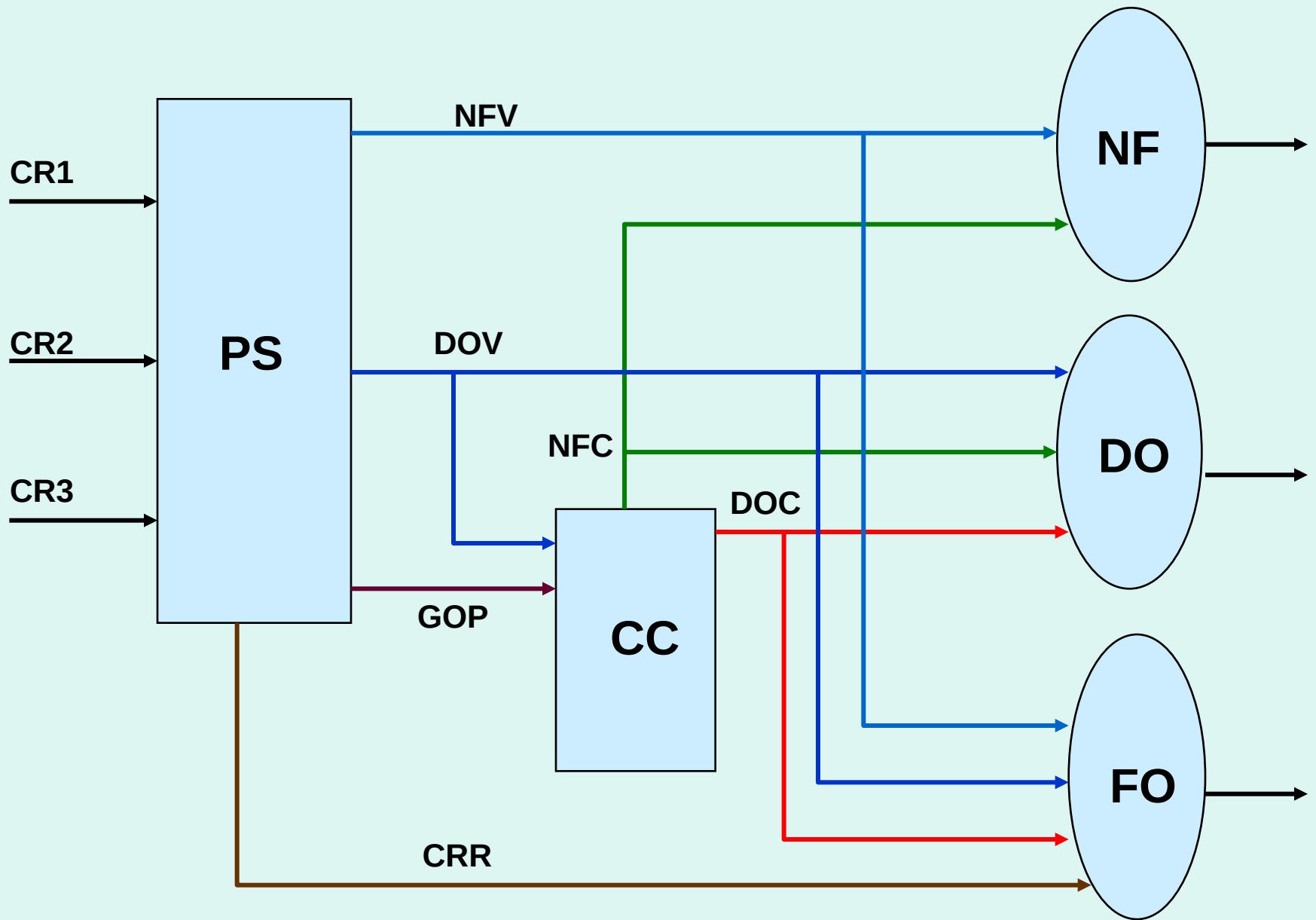
| <b>ESPECIFICACIONES COMERCIALES<br/>DEL FUEL OIL</b> | <b>V.B.N.</b> |
|------------------------------------------------------|---------------|
| <b>Viscosity Blending Number Mínimo del Fuel Oil</b> | <b>21</b>     |
| <b>Crudo Reducido (CRR)</b>                          | <b>14</b>     |
| <b>Diesel Oil Catalítico (DOC)</b>                   | <b>52</b>     |
| <b>Diesel Oil Virgen (DOV)</b>                       | <b>42</b>     |
| <b>Nafta Virgen (NFV)</b>                            | <b>60</b>     |

| <b>COSTOS</b>                                         | <b>US\$/Bbl</b> |
|-------------------------------------------------------|-----------------|
| <b>Costo de adquisición del Crudo 1 (CR1)</b>         | <b>170</b>      |
| <b>Costo de adquisición del Crudo 2 (CR2)</b>         | <b>150</b>      |
| <b>Costo de adquisición del Crudo 3 (CR3)</b>         | <b>130</b>      |
| <b>Costo incremental del Pipe Still (PS)</b>          | <b>5,00</b>     |
| <b>Costo incremental del Cracking Catalítico (CC)</b> | <b>10,00</b>    |

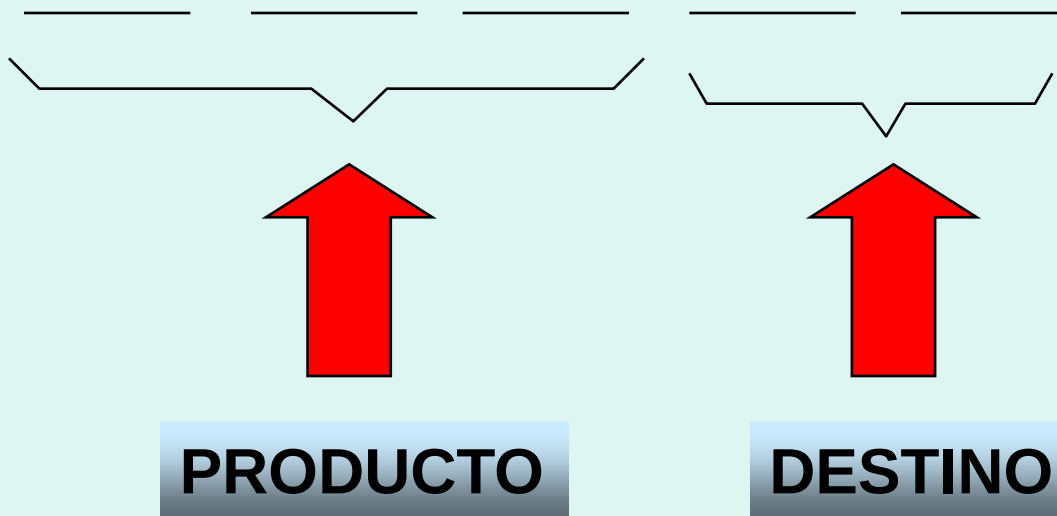
|                                  |            |
|----------------------------------|------------|
| <b>Costo Fijo diario (KUS\$)</b> | <b>200</b> |
|----------------------------------|------------|

| <b>PRECIO DE VENTA</b> | <b>US\$/Bbl</b> |
|------------------------|-----------------|
| <b>Nafta (NF)</b>      | <b>290</b>      |
| <b>Diesel Oil (DO)</b> | <b>240</b>      |
| <b>Fuel Oil (FO)</b>   | <b>210</b>      |

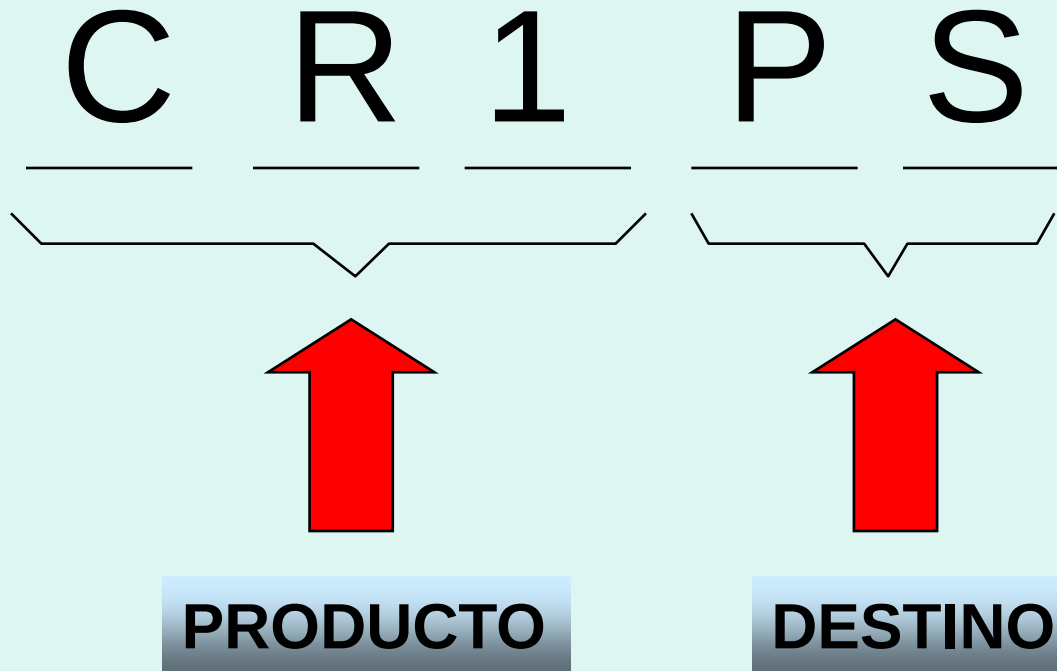




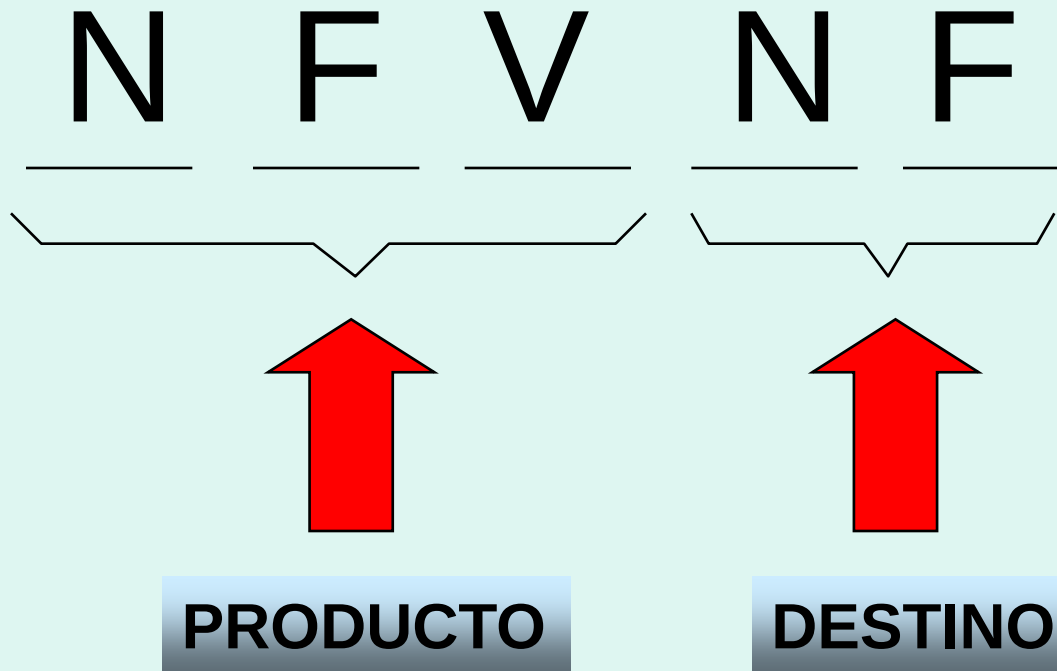
# NOMENCLATURA

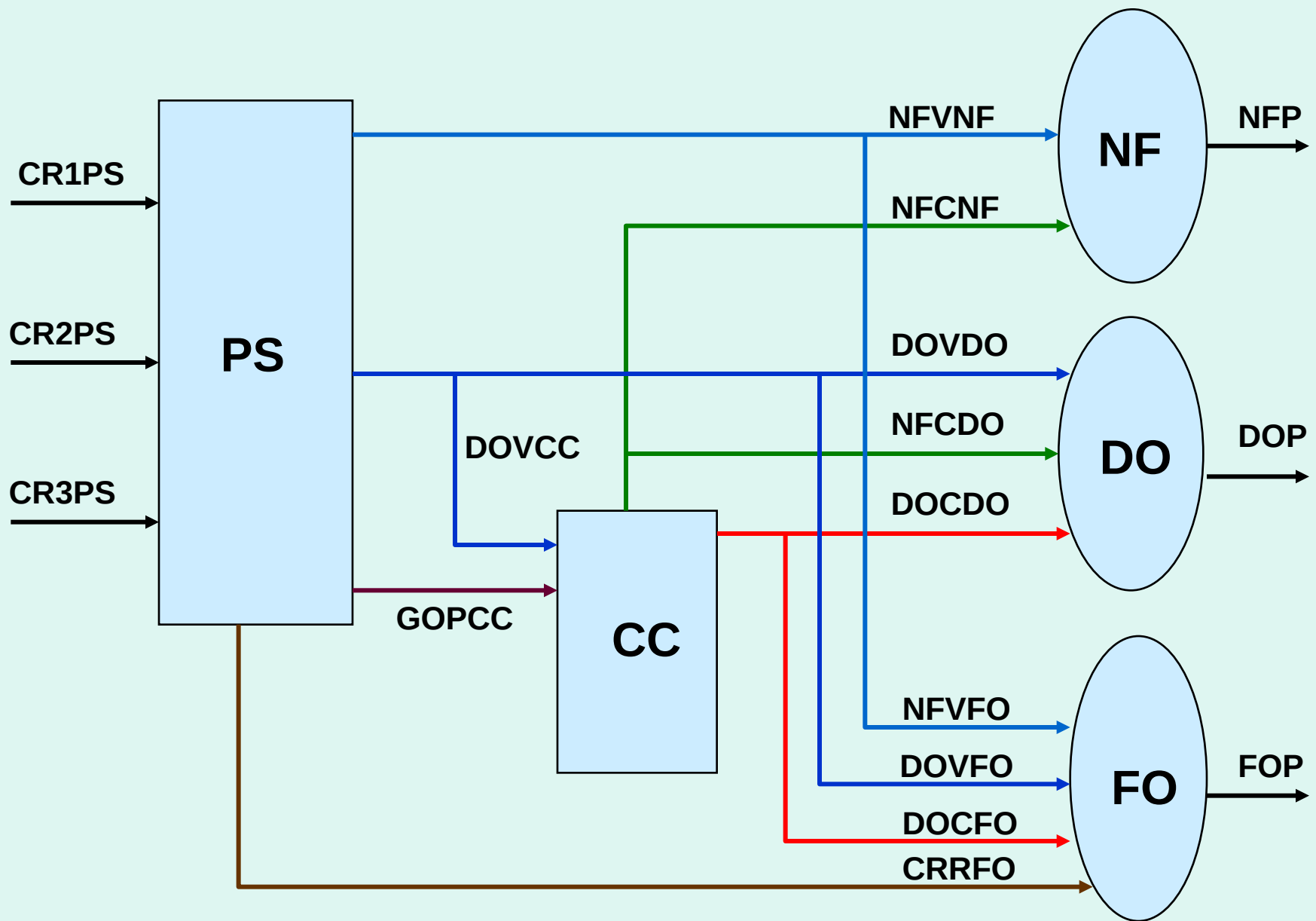


# NOMENCLATURA



# NOMENCLATURA





## TOTALIZADORES

$$\text{TOTALCR)} - \text{CRTPS} + \text{CR1PS} + \text{CR2PS} + \text{CR3PS} = 0$$

$$\text{TOTALCC)} - \text{ALICC} + \text{DOVCC} + \text{GOPCC} = 0$$

## DISPONIBILIDADES DE CRUDOS

$$\text{DISPCR1)} \quad \text{CR1PS} \leq 6$$

$$\text{DISPCR2)} \quad \text{CR2PS} \leq 6$$

$$\text{DISPCR3)} \quad \text{CR3PS} \leq 6$$

## CAPACIDADES DE LAS PLANTAS

**CAPACPS)**      **CRTPS  $\leq$  10**

**CAPACCC)**      **ALICC  $\leq$  6.5**

## RENDIMIENTOS PS

$$\text{RENDNFV)} - \text{NFVNF} - \text{NFVFO} + 0.23 \text{ CR1PS} + 0.15 \text{ CR2PS} + 0.03 \text{ CR3PS} = 0$$

$$\text{RENDDOV)} - \text{DOVCC} - \text{DOVDO} - \text{DOVFO} + 0.28 \text{ CR1PS} + 0.31 \text{ CR2PS} + 0.27 \text{ CR3PS} = 0$$

$$\text{RENDGOP)} - \text{GOPCC} + 0.40 \text{ CR1PS} + 0.35 \text{ CR2PS} + 0.27 \text{ CR3PS} = 0$$

$$\text{RENDCRR)} - \text{CRRFO} + 0.080 \text{ CR1PS} + 0.18 \text{ CR2PS} + 0.42 \text{ CR3PS} = 0$$

## RENDIMIENTOS CC

### RENDNFC)

$$- \text{NFCNF} - \text{NFCDO} + 0.25 \text{ DOVCC} + 0.55 \text{ GOPCC} = 0$$

### RENDDOC)

$$- \text{DOCDO} - \text{DOCFO} + 0.85 \text{ DOVCC} + 0.60 \text{ GOPCC} = 0$$

## NAFTA PRODUCIDA

$$\text{PRODUNF)} \quad - \text{NFP} + \text{NFVNF} + \text{NFCNF} = 0$$

$$\text{OCTANNF)} \quad - 80 \text{NFP} + 59 \text{NFVNF} + 98 \text{NFCNF} \geq 0$$

$$\text{REQUENF)} \quad \text{NFP} \leq 4$$

## **DIESEL OIL PRODUCIDO**

**PRODUDO)**     $- \text{DOP} + \text{DOVDO} + \text{DOCDO} + \text{NFCDO} = 0$

**FLASHDO)**     $- 0.1 \text{ DOP} + \text{NFCDO} \leq 0$

**REQUEDO)**     $\text{DOP} \leq 4$

## FUEL OIL PRODUCIDO

### PRODUFO)

$$-FOP + NFVFO + DOVFO + DOCFO + CRRFO = 0$$

### VISCOFO)

$$- 21 FOP + 60 NFVFO + 42 DOVFO + 52 DOCFO + 14 CRRFO \geq 0$$



# ECONÓMICAS

## INGRESO)

$$-\text{INGRESO} + 290 \text{ NFP} + 240 \text{ DOP} + 210 \text{ FOP} = 0$$

## COSTOCR)

$$-\text{COSTOCR} + 170 \text{ CR1PS} + 150 \text{ CREPS} + 130 \text{ CR3PS} = 0$$

## COSTOVA)

$$-\text{COSTOVA} + 5 \text{ CRTPS} + 10 \text{ ALICC} = 0$$

## COSTOFJ)

$$-\text{COSTOFJ} = 200$$

**FUNCIONAL**

**MAX UTILIDAD)**

**INGRESO – COSTOCR – COSTOVA – COSTOFJ**

MAX UTILIDAD)  $\text{INGRESO} - \text{COSTOCR} - \text{COSTOVA} - \text{COSTOFJ}$

ST

INGRESO)  $- \text{INGRESO} + 290 \text{ NFP} + 240 \text{ DOP} + 210 \text{ FOP} = 0$

COSTOCR)  $- \text{COSTOCR} + 170 \text{ CR1PS} + 150 \text{ CR2PS} + 130 \text{ CR3PS} = 0$

COSTOVA)  $- \text{COSTOVA} + 5 \text{ CRTPS} + 10 \text{ ALICC} = 0$

COSTOFJ)  $\text{COSTOFJ} = 200$

!TOTALIZADORES

TOTALCR)  $- \text{CRTPS} + \text{CR1PS} + \text{CR2PS} + \text{CR3PS} = 0$

TOTALCC)  $- \text{ALICC} + \text{DOVCC} + \text{GOPCC} = 0$

!DISPONIBILIDADES DE CRUDOS

DISPCR1)  $\text{CR1PS} < 6$

DISPCR2)  $\text{CR2PS} < 6$

DISPCR3)  $\text{CR3PS} < 6$

!CAPACIDADES DE LAS PLANTAS

CAPACPS)  $\text{CRTPS} < 12$

CAPACCC)  $\text{ALICC} < 6.5$

#### **!RENDIMIENTOS PS**

$$\text{RENDNFV)} \quad - \text{NFVNF} - \text{NFVFO} + 0.23 \text{ CR1PS} + 0.15 \text{ CR2PS} + 0.03 \text{ CR3PS} = 0$$

$$\text{RENDDOV)} \quad - \text{DOVCC} - \text{DOVDO} - \text{DOVFO} + 0.28 \text{ CR1PS} + 0.31 \text{ CR2PS} + 0.27 \text{ CR3PS} = 0$$

$$\text{RENDGOP)} \quad - \text{GOPCC} + 0.40 \text{ CR1PS} + 0.35 \text{ CR2PS} + 0.27 \text{ CR3PS} = 0$$

$$\text{RENDCRR)} \quad - \text{CRRFO} + 0.080 \text{ CR1PS} + 0.18 \text{ CR2PS} + 0.42 \text{ CR3PS} = 0$$

#### **!RENDIMIENTOS CC**

$$\text{RENDNFC)} \quad - \text{NFCNF} - \text{NFCDO} + 0.25 \text{ DOVCC} + 0.55 \text{ GOPCC} = 0$$

$$\text{RENDDOC)} \quad - \text{DOCDO} - \text{DOCFO} + 0.85 \text{ DOVCC} + 0.60 \text{ GOPCC} = 0$$

#### **!NAFTA PRODUCIDA**

$$\text{PRODUNF)} \quad - \text{NFP} + \text{NFVNF} + \text{NFCNF} = 0$$

$$\text{OCTANNF)} \quad - 80 \text{ NFP} + 59 \text{ NFVNF} + 98 \text{ NFCNF} > 0$$

$$\text{REQUENF)} \quad \text{NFP} < 4$$

#### **!DIESEL OIL PRODUCIDO**

$$\text{PRODUDO)} \quad - \text{DOP} + \text{DOVDO} + \text{DOCDO} + \text{NFCDO} = 0$$

$$\text{FLASHDO)} \quad - 0.1 \text{ DOP} + \text{NFCDO} < 0$$

$$\text{REQUEDO)} \quad \text{DOP} < 4$$

#### **!FUEL OIL PRODUCIDO**

$$\text{PRODUFO)} \quad - \text{FOP} + \text{NFVFO} + \text{DOVFO} + \text{DOCFO} + \text{CRRFO} = 0$$

$$\text{VISCOFO)} \quad - 21 \text{ FOP} + 60 \text{ NFVFO} + 42 \text{ DOVFO} + 52 \text{ DOCFO} + 14 \text{ CRRFO} > 0$$

LP OPTIMUM FOUND AT STEP 23

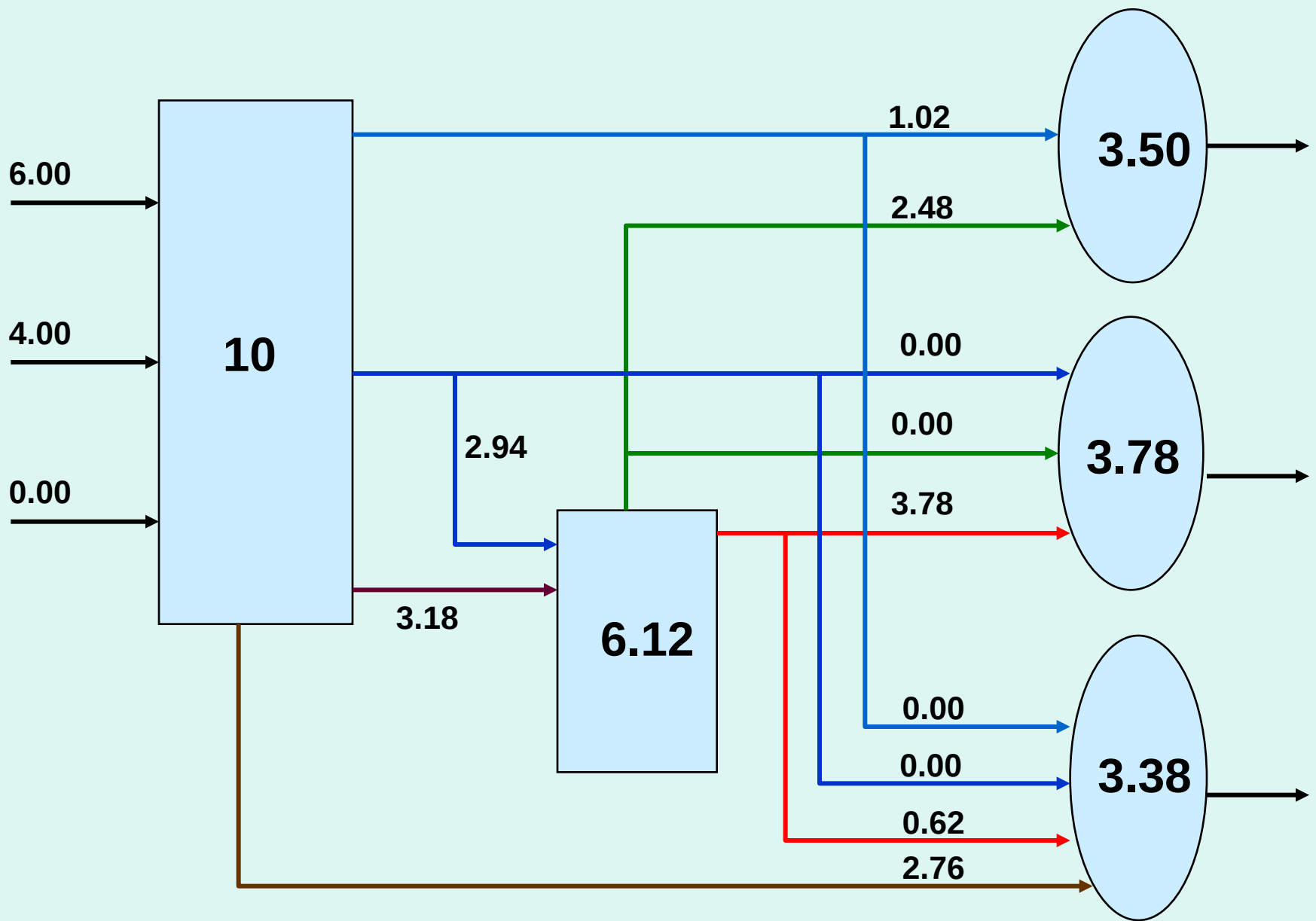
OBJECTIVE FUNCTION VALUE

UTILIDAD) 903.5432

| VARIABLE | VALUE       | REDUCED COST |
|----------|-------------|--------------|
| INGRESO  | 2634.743164 | 0.000000     |
| COSTOCR  | 1420.000000 | 0.000000     |
| COSTOVA  | 111.199997  | 0.000000     |
| COSTOFJ  | 200.000000  | 0.000000     |
| NFP      | 3.504000    | 0.000000     |
| DOP      | 3.783774    | 0.000000     |
| FOP      | 3.383226    | 0.000000     |
| CR1PS    | 0.000000    | 10.276772    |
| CR2PS    | 6.000000    | 0.000000     |
| CR3PS    | 4.000000    | 0.000000     |
| CRTPS    | 10.000000   | 0.000000     |
| ALICC    | 6.120000    | 0.000000     |
| DOVCC    | 2.940000    | 0.000000     |
| GOPCC    | 3.180000    | 0.000000     |
| NFVNF    | 1.020000    | 0.000000     |
| NFVFO    | 0.000000    | 42.258064    |
| DOVDO    | 0.000000    | 26.500000    |
| DOVFO    | 0.000000    | 36.177418    |
| CRRFO    | 2.760000    | 0.000000     |
| NFCNF    | 2.484000    | 0.000000     |
| NFCDO    | 0.000000    | 50.000000    |
| DOCDO    | 3.783774    | 0.000000     |
| DOCFO    | 0.623226    | 0.000000     |

| ROW      | SLACK OR SURPLUS | DUAL PRICES |
|----------|------------------|-------------|
| INGRES0) | 0.000000         | -1.000000   |
| COSTOCR) | 0.000000         | 1.000000    |
| COSTOVA) | 0.000000         | 1.000000    |
| COSTOFJ) | 0.000000         | -1.000000   |
| TOTALCR) | 0.000000         | 115.254837  |
| TOTALCC) | 0.000000         | 10.000000   |
| DISPCR1) | 6.000000         | 0.000000    |
| DISPCR2) | 0.000000         | 0.165806    |
| DISPCR3) | 2.000000         | 0.000000    |
| CAPACPS) | 0.000000         | 110.254837  |
| CAPACCC) | 0.380000         | 0.000000    |
| RENDNFV) | 0.000000         | -290.000000 |
| RENDDOV) | 0.000000         | -266.500000 |
| RENDGOP) | 0.000000         | -293.500000 |
| RENDCRR) | 0.000000         | -203.225800 |
| RENDNFC) | 0.000000         | -290.000000 |
| RENDDOC) | 0.000000         | -240.000000 |
| PRODUNF) | 0.000000         | -290.000000 |
| OCTANNF) | 23.292000        | 0.000000    |
| REQUENF) | 0.496000         | 0.000000    |
| PRODUDO) | 0.000000         | -240.000000 |
| FLASHDO) | 0.378377         | 0.000000    |
| REQUEDO) | 0.216226         | 0.000000    |
| PRODUF0) | 0.000000         | -189.677414 |
| VISCOF0) | 0.000000         | -0.967742   |

NO. ITERATIONS= 23



SI SE PUDIERA  
INCREMENTAR LA  
DISPONIBILIDAD DE LA  
TORRE DE  
DESTILACIÓN A 12.000  
BARRILES DIARIOS?

**UTILIDAD) 1091.040**

| <b>VARIABLE</b> | <b>VALUE</b>       | <b>REDUCED COST</b> |
|-----------------|--------------------|---------------------|
| <b>INGRESO</b>  | <b>3096.040039</b> | <b>0.000000</b>     |
| <b>COSTOCR</b>  | <b>1680.000000</b> | <b>0.000000</b>     |
| <b>COSTOVA</b>  | <b>125.000000</b>  | <b>0.000000</b>     |
| <b>COSTOFJ</b>  | <b>200.000000</b>  | <b>0.000000</b>     |
| <b>NFP</b>      | <b>3.821000</b>    | <b>0.000000</b>     |
| <b>DOP</b>      | <b>4.000000</b>    | <b>0.000000</b>     |
| <b>FOP</b>      | <b>4.895000</b>    | <b>0.000000</b>     |
| <b>CR1PS</b>    | <b>0.000000</b>    | <b>11.874997</b>    |
| <b>CR2PS</b>    | <b>6.000000</b>    | <b>0.000000</b>     |
| <b>CR3PS</b>    | <b>6.000000</b>    | <b>0.000000</b>     |
| <b>CRTPS</b>    | <b>12.000000</b>   | <b>0.000000</b>     |
| <b>ALICC</b>    | <b>6.500000</b>    | <b>0.000000</b>     |
| <b>DOVCC</b>    | <b>2.780000</b>    | <b>0.000000</b>     |
| <b>GOPCC</b>    | <b>3.720000</b>    | <b>0.000000</b>     |
| <b>NFVNF</b>    | <b>1.080000</b>    | <b>0.000000</b>     |
| <b>NFVFO</b>    | <b>0.000000</b>    | <b>80.000000</b>    |
| <b>DOVDO</b>    | <b>0.700000</b>    | <b>0.000000</b>     |
| <b>DOVFO</b>    | <b>0.000000</b>    | <b>0.000000</b>     |
| <b>CRRFO</b>    | <b>3.600000</b>    | <b>0.000000</b>     |
| <b>NFCNF</b>    | <b>2.741000</b>    | <b>0.000000</b>     |
| <b>NFCDO</b>    | <b>0.000000</b>    | <b>80.000000</b>    |
| <b>DOCDO</b>    | <b>3.300000</b>    | <b>0.000000</b>     |
| <b>DOCFO</b>    | <b>1.295000</b>    | <b>0.000000</b>     |