

**ELECTRICITY SAVING IN AIR  
CONDITIONING UNIT WITH USED  
ENVIRONMENT FRIENDLY  
“CRYOGAS” REFRIGERANT**

**BY :**

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**PURPOSED OF ELECTRICITY SAVING IN  
AIR CONDITIONING WITH USED  
ENVIRONMENT FRIENDLY “CRYOGAS”  
REFRIGERANT**

**✉ WITH PERFORM TO ACTIVITY  
REPLACEMENT FREON REFRIGERANT  
IN AIR CONDITIONING UNIT BY  
CRYOGAS HYDROCARBON  
REFRIGERANT WITH THE SAME GRADE,  
WITHOUT TO ADD NEW COMPONENT IN  
AIR CONDITIONING UNIT.**

# **CLASIFICACION OF REFRIGERATION AND AIR CONDITIONING**

- **DOMESTIC REFRIGERATION**
- **COMMERCIAL REFRIGERATION**
- **INDUSTRIAL REFRIGERATION**
- **MARINE AND TRANSPORTATION  
REFRIGERATION**
- **COMFORT AIR CONDITIONING**
- **INDUSTRIAL AIR CONDITIONING**
- **CAR AIR CONDITIONING**

**INTERNATIONAL AND NATIONAL  
REGULATION DEFINE USED OF FREON  
REFRIGERANT**

- **MONTREAL PROTOCOL**
  - **WINA KONVENSI**
- **LONDON AMANDEMENT**
  - **KYOTO PROTOCOL**
  - **KEPRES NO. 23/1992**

# COMPOSITION OF MEAN ELECTRICITY CONSUMPTION EQUIPMENT IN COMMERCIAL BUILDING

<b>NO</b>	<b>EQUIPMENT</b>	<b>ELECTRICITY CONSUMPTION (%)</b>
<b>1</b>	<b>AIR CONDITIONING</b>	<b>55</b>
<b>2</b>	<b>LIGHTING</b>	<b>18</b>
<b>3</b>	<b>LIFT</b>	<b>8</b>
<b>4</b>	<b>PUMP</b>	<b>9</b>
<b>5</b>	<b>OTHERS</b>	<b>11</b>

# ENVIRONMENT INDEKS VALUE OF OTHER REFRIGERANT COMPARED WITH CRYOGAS REFRIGERANT

<b>NO</b>	<b>REFRIGERANT</b>	<b>ODP</b>	<b>GWP</b>	<b>ALT</b>
<b>1</b>	<b>R-12</b>	<b>1</b>	<b>7.400</b>	<b>130</b>
<b>2</b>	<b>R-22</b>	<b>0,055</b>	<b>2.600</b>	<b>15</b>
<b>3</b>	<b>R-134A</b>	<b>0</b>	<b>1.900</b>	<b>13</b>
<b>4</b>	<b>R-407A</b>	<b>0</b>	<b>1.620</b>	<b>-</b>
<b>5</b>	<b>R-403A</b>	<b>0,032</b>	<b>2.040</b>	<b>-</b>
<b>6</b>	<b>HYDROCARBON (CRYOGAS)</b>	<b>0</b>	<b>3</b>	<b>&lt; 3</b>

# **THE KIND OF CRYOGAS REFRIGERANT**

- ↙ CRYOGAS-12 : REPLACEMENT FOR  
FREON R-12**
- ↙ CRYOGAS-22 : REPLACEMENT FOR  
FREON R-22**
- ↙ CRYOGAS 34 : REPLACEMENT FOR  
FREON R-134A**

# **ADVANTAGE OF CRYOGAS REFRIGERANT**

- ↳ ENVIRONMENT FRIENDLY REFRIGERANT**
- ↳ HAVE A HIGH LATENT HEAT OF VAPORIZATION**
- ↳ FAMILIAR WITH SINTETIC AND MINERAL OIL**
- ↳ CAN DO ELECTRICITY SAVING UNTIL 20%**
- ↳ CAN NOT CORROSION IN MATERIAL PIPING  
AND OTHER COMPONENT**
- ↳ FAMILIAR WITH SINTETIC RUBBER SEAL**
- ↳ SUPORT WITH INTERNATIONAL AND NATIONAL  
REGULATIONS**
- ↳ NO POISON**



# CHARACTERISTIC THERMODYNAMIC CRYOGAS -22 REFRIGERANT COMPARED WITH FREON R-22

<b>NO</b>	<b>INFORMATION</b>	<b>UNIT</b>	<b>CRYOGAS-22</b>	<b>FREON-22</b>
<b>1</b>	<b>BOILING POINT, NBP</b>	<b>°C</b>	<b>-43</b>	<b>-40</b>
<b>2</b>	<b>LATEN HEAT VAPORIZATION, NBP</b>	<b>KJ / KG</b>	<b>426</b>	<b>233</b>
<b>3</b>	<b>DENSITY OF SATURATED LIQUID</b>	<b>Mg / M<sup>3</sup></b>	<b>0,487</b>	<b>1,194</b>
<b>4</b>	<b>HEAT CONDUCTIVITY OF SATURATED LIQUID</b>	<b>W / M<sup>2</sup> °C</b>	<b>0,094</b>	<b>0,095</b>
<b>5</b>	<b>VISCOSITY OF SATURATED LIQUID</b>	<b>CENTIPOIS</b>	<b>0,09</b>	<b>0,15</b>

# CHARACTERISTIC THERMODYNAMIC CRYOGAS -12 REFRIGERANT COMPARED WITH FREON R-12

<b>NO</b>	<b>INFORMATION</b>	<b>UNIT</b>	<b>CRYOGAS-12</b>	<b>FREON-12</b>
<b>1</b>	<b>BOILING POINT, NBP</b>	<b>°C</b>	<b>-28</b>	<b>-29,8</b>
<b>2</b>	<b>LATEN HEAT VAPORIZATION, NBP</b>	<b>KJ / KG</b>	<b>404</b>	<b>165</b>
<b>3</b>	<b>DENSITY OF SATURATED LIQUID</b>	<b>Mg / M<sup>3</sup></b>	<b>0,487</b>	<b>1,194</b>
<b>4</b>	<b>HEAT CONDUCTIVITY OF SATURATED LIQUID</b>	<b>W / M<sup>2</sup> °C</b>	<b>0,1</b>	<b>0,0692</b>
<b>5</b>	<b>VISCOSITY OF SATURATED LIQUID</b>	<b>CENTIPOIS</b>	<b>0,11</b>	<b>0,19</b>

# CHARACTERISTIC THERMODYNAMIC CRYOGAS-34 REFRIGERANT COMPARED WITH FREON R-134a

<b>NO</b>	<b>INFORMATION</b>	<b>UNIT</b>	<b>CRYOGAS-34</b>	<b>FREON-134a</b>
<b>1</b>	<b>BOILING POINT, NBP</b>	<b>°C</b>	<b>-29</b>	<b>-26,1</b>
<b>2</b>	<b>LATEN HEAT VAPORIZATION, NBP</b>	<b>KJ / KG</b>	<b>406</b>	<b>217</b>
<b>3</b>	<b>DENSITY OF SATURATED LIQUID</b>	<b>Mg / M<sup>3</sup></b>	<b>0,5166</b>	<b>1,187</b>
<b>4</b>	<b>HEAT CONDUCTIVITY OF SATURATED LIQUID</b>	<b>W / M<sup>2</sup> °C</b>	<b>0,1</b>	<b>0,08</b>
<b>5</b>	<b>VISCOSITY OF SATURATED LIQUID</b>	<b>CENTIPOIS</b>	<b>0,11</b>	<b>0,20</b>

# **STANDARD OPERATING PROCEDURE REPLACEMENT FREON REFRIGERANT TO CRYOGAS REFRIGERANT IN REFRIGERATION AND AIR CONDITIONING UNITS**

- ← CHECK THE PERFORMANCE UNIT BEFORE REPLACEMENT  
(PRESSURE, CURRENT AND TEMPERATURE)**
- ← DO RECOVERY FREON REFRIGERANT FROM UNIT**
- ← DO VACUUM THE UNIT**
- ← DO LEAK TESTING IN THE PIPING OF THE UNIT**
- ← DO CHARGING THE UNIT WITH CRYOGAS REFRIGERANT IN  
THE SAME GRADE**
- ← CHECK THE PERFORMANCE OF UNIT AFTER REPLACEMENT  
(PRESSURE, CURRENT AND TEMPERATURE)**
- ← GIVE INFORMATION THAT UNIT HAS REPLACEMENT WITH  
CRYOGAS REFRIGERANT BY STICKER**

**GAIN OF MEAN ELECTRICITY SAVING AND COST SAVING USED  
CRYOGAS REFRIGERANT IN AIR CONDITIONING BASED ON SOME  
CAPACITY OF COMPRESSOR UNIT**

<b>CAPACITY COMPRESSOR (PK)</b>	<b>ELECTRICITY SAVING (%)</b>	<b>COST SAVING (Rp.)</b>
<b>0,75</b>	<b>14</b>	<b>25.500,-</b>
<b>1</b>	<b>18</b>	<b>30.100,-</b>
<b>1,5</b>	<b>19</b>	<b>35.500,-</b>
<b>2</b>	<b>20</b>	<b>52.000,-</b>
<b>UP TO 2,5</b>	<b>20</b>	<b>63.000,-</b>

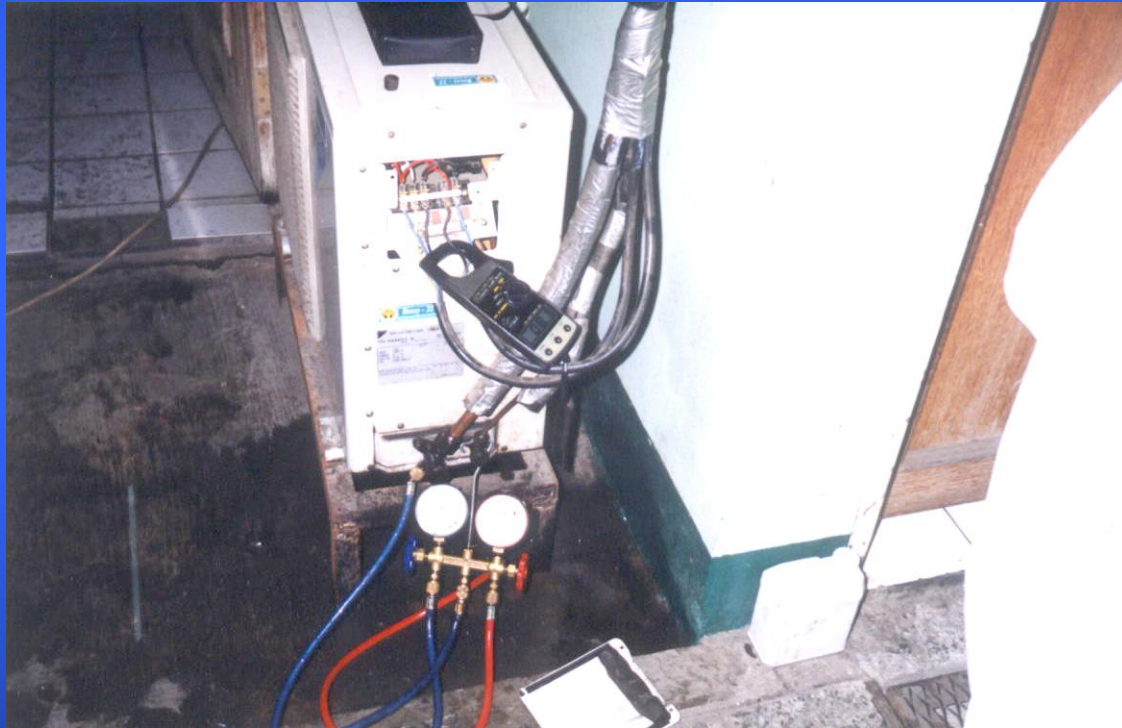
# REPLACEMENT ACTIVITY FREON REFRIGERANT BY CRYOGAS REFRIGERANT IN CAR AIR CONDITIONING



# EXPLANATION RECOVERY FREON REFRIGERANT BY UNIT RECOVERY IN COCA-COLA COMPANY



# CHECK OF PERFORMANCE IN AIR CONDITIONING SPLIT SYSTEM AFTER REPLACEMENT WITH CRYOGAS REFRIGERANT





**GAIN OF ELECTRICITY SAVING AFTER REPLACEMENT BY  
CRYOGAS REFRIGERANT IN AIR CONDITIONING SPLIT  
SYSTEM**

<b>NO</b>	<b>INFORMATION</b>	<b>FREON – 22</b>	<b>CRYOGAS – 22</b>
<b>1</b>	<b>CURRENT OF COMPRESSOR (AMPER)</b>	<b>8,9</b>	<b>7,4</b>
<b>2</b>	<b>VOLTAGE (VOLT)</b>	<b>220</b>	<b>220</b>
<b>3</b>	<b>ELECTRICITY CONSUMPTION (WATT)</b>	<b>1.958</b>	<b>1.628</b>
<b>4</b>	<b>COOL AIR TEMPERATURE (C)</b>	<b>14</b>	<b>11</b>
<b>5</b>	<b>ELECTRICITY SAVING (WATT)</b>	<b>-----</b>	<b>330</b>

# GAIN OF ELECTRICITY SAVING AFTER REPLACEMENT BY CRYOGAS REFRIGERANT IN WINDOWS AIR CONDITIONING

<b>NO</b>	<b>KETERANGAN</b>	<b>FREON - 22</b>	<b>CRYOGAS – 22</b>
<b>1</b>	<b>CURRENT OF COMPRESSOR (AMPER)</b>	<b>4,4</b>	<b>3,1</b>
<b>2</b>	<b>VOLTAGE(VOLT)</b>	<b>220</b>	<b>220</b>
<b>3</b>	<b>ELECTRICITY CONSUMPTION (WATT)</b>	<b>986</b>	<b>682</b>
<b>4</b>	<b>COOL AIR TEMPERATURE (C)</b>	<b>12</b>	<b>10</b>
<b>5</b>	<b>ELECTRICITY SAVING (WATT)</b>	<b>-----</b>	<b>286</b>

# CHECK OF PERFORMANCE REFRIGERATION UNIT FOR CONTAINER BEFORE REPLACEMENT BY CRYOGAS REFRIGERANT



# REPLACEMENT ACTIVITY BY CRYOGAS REFRIGERANT IN AIR CONDITIONING PACKAGED DUCT SYSTEM



# GAIN OF ELECTRICITY SAVING AFTER USED CRYOGAS REFRIGERANT IN AIR CONDITIONING PACKAGED DUCT SYSTEM

NO	KETERANGAN	FREON - 22	CRYOGAS – 22
1	MEAN CURRENT COMPRESSOR (AMPER)	15,8	13,1
2	VOLTAGE (VOLT)	380	380
3	ELECTRICITY CONSUMPTION (WATT)	5.103	4.231
4	COOL AIR TEMPERATURE (C)	19	17
5	ELECTRICITY SAVING (WATT)	-----	872

## **EXPLANATION ACTIVITY USED CRYOGAS REFRIGERANT IN WATER DISPENSER UNITS**



# RECOVERY ACTIVITY FREON REFRIGERANT FROM CENTRAL AIR CONDITIONING UNIT



# VACCUM ACTIVITY IN CENTRAL AIR CONDITIONING UNIT





# CHARGING ACTIVITY WITH CRYOGAS REFRIGERANT IN CENTRAL AIR CONDITIONING SYSTEM



# GAIN OF ELECTRICITY SAVING IN CENTRAL AIR CONDITIONING AFTER USED CRYOGAS REFRIGERANT

N O	KETERANGAN	FREON-22	CRYOGAS- 22
1	MEAN CURRENT EACH COMPRESSOR (R,S,T) (AMPER)	65,8	50,8
2	VOLTAGE (VOLT)	460	460
3	ELECTRICITY CONSUMPTION EACH COMPRESSOR (K watt)	39,35	30,38
4	COOL AIR TEMPERATURE (C)	17	17
5	ELECTRICITY SAVING EACH COMPRESSOR (K watt)	-----	8,97

**GAIN OF COST SAVING AFTER USED CRYOGAS REFRIGERANT  
IN AIR CONDITIONING UNIT EVERY MONTH IN SOME  
INSTITUTION**

<b>INSTITUTION NAME</b>	<b>SUM OF CAPACITY AIR CONDITIONING UNITS (PK)</b>	<b>TYPE OF AIR CONDITIONING UNITS</b>	<b>GAIN OF COST SAVING EVERY MONTH (RP.)</b>
<b>ASTRA FEDERAL MOTOR</b>	<b>150</b>	<b>SPLIT/SPLIT DUCT</b>	<b>1.850.000,-</b>
<b>ASTRA SUNTER I</b>	<b>279</b>	<b>SPLIT</b>	<b>3.000.000,-</b>
<b>ASTRA SUNTER II</b>	<b>250</b>	<b>SPLIT</b>	<b>2.150.000,-</b>
<b>TRISULATEK</b>	<b>198</b>	<b>WINDOW/SPLIT</b>	<b>1.950.000,-</b>
<b>M2M</b>	<b>1950</b>	<b>AC SENTRAL</b>	<b>5.780.000,-</b>
<b>RCTI</b>	<b>200</b>	<b>AC SENTRAL</b>	<b>1.200.000,-</b>