Solar Heat for Industrial Processes

Renewable Energy Technologies

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Importance of the Industry in Jordan

• Employs about 18% of Jordan’s man power
• Its direct share of GDP is 25%
• Direct and indirect share are about 40% of the GDP
• The Jordanian industrial exports are estimated to be about 7 billion USD.
• Jordan industrial sector consumed about 1,079.4 ktoe which resample 20% of the total energy final consumption in Jordan.
WHY WE NEED TO DEVELOP RENEWABLE ENERGY RESOURCES FOR INDUSTRIAL SECTOR
Jordan

has

Very Good Solar and wind resources

Utilized by

RE Technologies

which are mostly

Wind  PV  Thermal

can be

Energy Alternatives

for

need

for

industrial sector

for

compativeness

additional challenges

bring

cost

has no

Oil or Gas

which makes it

fully dependent

on

neighbouring countries

when

Geopolitical situation crumples

resulting in

less production

less export

Energy crisis

harder logistics

lead to

less Utilization Ratio
Jordan

- Has
- Has no Oil or Gas, which makes it fully dependent on neighbouring countries when geopolitical situation crumbles

Very Good Solar and wind resources
- Utilized by RE Technologies
  - Which are mostly Wind, PV, Thermal

Independent

Energy Alternatives for need
4-May-1996 Fuel oil prices were increased fuel oil for all sectors [43]

20-Feb-1992 despite the oil Agreement with Iraq in 1991 the prices of oil products were increased. The home users of diesel were compensated and fuel oil to electric company to be sold at preferential price [39,41,42]

11-Jul-2001 the prices of all fuels were increased except fuel oil [45, 46]

Aug-1999 Prices of Gasoline were increased other fuels pieces unchanged [44]

May-2003 increase of all fuel prices following Iraq invasion and in spite the Oil grant from GCC. Government plans induced by International Bank to liberate the Fuel prices in Jordan. [39]

Feb-2008 high increase of oil prices, liberation of fuel prices, prices increased monthly until crude prices collapsed after the financial crisis in 2008 [62,63,64]

Jan-2011 fixing fuel prices in the light of the unrest accompanied the Arab Spring [65]

Apr-2004 Launch of a package of economic measures to raise subsidies of oil products [47, 48]

Feb-2007 fuel oil prices liberation, and to be priced monthly [53-61]

Apr-2006 significant increase in fuel prices coincided with a social safety net. Decline of oil prices postponed liberation plans [51,52]

Jul-Nov-2005 two consecutive increments in fuel prices and the publication of the government's plans to liberalize fuel prices completely in two stages in 2006 and 2007 [49,50]
What are the Renewable Resources that can be used in the industrial sector?
Heat vs. Electricity

- Industrial electrical consumption is about 25% of the total Electrical consumption in Jordan.
- Electricity constitute one third of the Industrial consumption while the rest of it is used to generate the heat needed for the industrial processes.
- that means industrial process heat accounts for 13.5% of the total final energy consumption in Jordan, and about 50% from the thermal energy national demand.
<table>
<thead>
<tr>
<th>Year</th>
<th>Sector</th>
<th>Total Industry</th>
<th>Mining and manufacturing</th>
<th>Petroleum sector</th>
<th>Electricity Sector</th>
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<tbody>
<tr>
<td>2009</td>
<td>Elec.</td>
<td>3.42%</td>
<td>3.77%</td>
<td>1.46%</td>
<td>0.23%</td>
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<td>Fuel</td>
<td>8.55%</td>
<td>5.56%</td>
<td>23.67%</td>
<td>37.33%</td>
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<td>9.33%</td>
<td>25.14%</td>
<td>37.57%</td>
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<td>Elec.</td>
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<td>3.75%</td>
<td>1.20%</td>
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<td>17.09%</td>
<td>9.15%</td>
<td>23.28%</td>
<td>139.52%</td>
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<tr>
<td>2011</td>
<td>Elec.</td>
<td>4.08%</td>
<td>3.66%</td>
<td>1.10%</td>
<td>-0.15%</td>
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<tr>
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<td>Fuel</td>
<td>27.07%</td>
<td>5.77%</td>
<td>18.31%</td>
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<td>31.15%</td>
<td>9.44%</td>
<td>19.41%</td>
<td>-123.89%</td>
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<td>3.70%</td>
<td>1.32%</td>
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<td>Fuel</td>
<td>29.09%</td>
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<td>20.86%</td>
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<tr>
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<td>33.27%</td>
<td>9.35%</td>
<td>22.18%</td>
<td>-127.78%</td>
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<td>2013</td>
<td>Elec.</td>
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<td>3.50%</td>
<td>1.59%</td>
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<td>Sum</td>
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<td>8.97%</td>
<td>21.54%</td>
<td>-148.48%</td>
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</tbody>
</table>

- Transaction to coal from fuel oil and diesel reduced the energy specific intensity (ktoe/JD).
- The shift to less intensive energy industries;
- Importing some of the raw material that need a lot of energy in the production phase instead of producing it locally
- The partial subsidies of electricity and diesel ease the effect of the prices for some time.
- The increment of the fuel prices has been shifted to the consumers by increasing the prices of the manufactured goods.
Economizer
For bottle wash
The 223 kW concentrating solar power (CSP) system in Ram pharma