The first Power Station from Landfill Gas in the Middle East

Mashhad Municipality Recycling Organization
General Aims

✓ Deduction of environmental destructive effects result from emission of greenhouse gases
✓ Development of using modern energies and it’s situation with previous fuels
✓ Deduction of exposed bad odor in landfill places via gathering and obtaining energy from resultant gases
✓ Utilization of economical sources in the form of selling produced power and related advantages in the frame of Cleaning Development Mechanism

General Specifications of Project

✓ Efficient Work Hours of Power Station in a year: 7500 h/year
✓ Produced Power Quality: 3 phases in 380 V to 400 w, frequency 50 Hz
✓ Site Area: 1000M2
✓ Capital: 15 milliard Rls
✓ Utilization Year: 2009
✓ Executor and Investor: Recycling Organization of Mashhad Municipality
منافع اقتصادی پروژه:

یکی از معایل برگ زیست محیطی دنیا با آن مواجه می‌باشد، تغییرات آب و هوا و هواپیمایی و در این میان کشورهای در حال توسعه از این جهت، با یکشترین آسیب ها و تهدیدهای رو به می‌باشد. زمین‌ریزیهای رو به می‌روید در حال گرم‌تر شدن است که یکی از دلایل این پدیده‌ها تغییرات جوی می‌باشد. جو و دمای و جویانه و دولت‌های برای مقابله با این، ابتکار، مطالعه و پژوهش برای تولید بروزات پایدار بایستی راه‌اندازی شود. منابع پاک و قابل تجدید استفاده، برای مقابله با این‌گونه تغییرات اقتصادی و اجتماعی ضروری است.

مزایای زیست محیطی پروژه:

در صورت دفن پسماندهای خاتمه‌ی در حال حاضر اکسیژن، بخش آلی پسماندهای مذکور تخمیر شده و ترکیبی از گازهای متان، دی اکسید کربن، هیدروژن، ازت و مقداری از ماده‌های کربنیک را انتشار می‌دهند که کره‌پوشیده شد و تبدیل می‌کند. در این‌جا، اکسید کربن و دی اکسید آن از دو ماه از دفن آغاز شده و تا 13 سال به لحاظ اقتصادی قابل بهره‌برداری می‌باشد.

پژوهشگران بیشتری از این‌روش انتشار آلاینده‌های سبز که از گاز‌های حامله اکسیژن، که وجود در این گونه داغ و گرم مقاومت‌های سخت‌الصدای و از انتشار شماری از آلاینده‌ها مثل دی اکسید کربن و دی اکسید گوگرد (یکی از عوامل دم آب از اسیدی) می‌باشد.

Economical Benefits of Projects

Regarding Guaranteed Power Purchase Contract from action of Biogas Consuming Power Station that made between Mashhad Municipality Recycling Organization and Modern Energy Organization (SANA) that based on rates approved by Islamic Conceal Meeting to produce power from modern energy and expected economical sources on the basis of quito contract, return investment has been considered.

Environmental Advantages Projects

One of the big problems that the world confronts with it is climatic changes. Among them, developing countries is confronted with these risks more than others. Earth is warming day by day because of atmospheric changes. Societies and governments need to enact direct rules or flexible regulations to control this problem. One of the most important sources of emission of greenhouse gases especially Methane is municipal waste landfill.

If domestic wastes are buried in absent of oxygen, organic compounds of buries wastes are fermented and compounds of gases such as Methane, Carbon dioxide, Hydrogen, Nitrate and some of chlorine and fluorine compounds and humidity are produced. Producing gas is usually started after 2 months of landfill and it will be utilized economically until 13 years. Additionally, recycling gas of landfill and changing it to energy prevent to emit pollutants directly, they also deduct to emit pollutant indirectly, because obtained gas is replaced coal and oil in this method and it deducts to emit many pollutants such as sulfur carbon dioxide (one of the reasons of acid rain).
Also, one of advantages of recycling available energy in gas of landfill is that it can reduce climatic changes significantly. Because this gas is the biggest source of emitting methane result from human’s actions. It is estimated that per tone of emitted methane (equal to 21 tone carbon dioxide during 100 years) will influence on global hot weather. Additionally, methane will pass its changes period 24 times faster than carbon dioxide, and it means that inhibition of producing and emission of methane can accelerate deduction process of climatic changes.

The Main Sections of Project

✓ Collection Network and Gas Transfer Line of Landfill in length of 1500m
✓ Pressure strengthening and gas refining station in capacity of 600m3/h made by Vandoril Co., Netherlands.
✓ 2 Biogas Consuming Engines in capacity of 660kw/h made by Man Co., Germany.
✓ Equipments of combusting additional gases in capacity of 600m3/h made by Vandoril Co., Netherlands.
✓ Power Station Connection System to power Network 20kv with all protective and measurement Equipments
✓ Main Site of Project, 1000m2, and power station building, 110m2

General Technical Specifications

1- Generator Motor and Site of Project

Engines and generators that used in the project are 2 sets in capacity of 330 kw/h. They are made by Man Co. in Germany. (Totally 660 kw/h)

EPA coefficient, regarding useful life of Biogas consuming Engines is 100,000 hours or more and it is recommended that biogas consuming power station capacity is considered 85% to 95%.
2- Gases Surplus Combusting Equipments

These specifications have been considered to combust gases surplus to requirements of generator engines, in capacity of 660 kw/h, in power station, if necessary. Also, this unite is equipped with protective cap for wind, automatic flash system and shore, burner cover preventing entry of fire into gas pipe and check valve.

3- Power Station Connecting System to Power Network

This system has been considered to connect output power of biogas consuming engine-generators (400 V, 3 phases) to line of 20 KV that is available in Mashhad Landfill where connected to Regional Electrical Power Company. This system is equipped with:

✓ Protection against short connection
✓ Protection against reverse power (returned power from power network to generator)
✓ Stop tools from network
✓ Tools of reviewing and controlling frequency voltage fluctuations
✓ Tools of reviewing and controlling frequency fluctuations
✓ Synchronizing tools (automatically and by hand)
✓ Reviewing tools of increasing voltage 400 V to 20 KV by ground current
Mean pressure controller tableau (20 KV) with measurement tools of electrical indexes

Weak pressure controller tableau (400 V) with measurement tools of electrical indexes

Ground (including cable, especial pit)

Electrical energy measurement contour

4- Capacity of Power Station

Named electrical capacity of each engine-generator that installed in this project has been noted 330 KV, but regarding of Mashhad landfill from the sea (1000 m) and climatic conditions, effective input power is considered 300 KV. Therefore, regarding there are 2 engine-generators that utilized in his project, electrical energy production capacity is minimum 600 KV in present conditions.

On the basis of studies in 2009, minimum gases that can in present conditions have been 400 m³/h and at the final year of utilization of power station, 2012, gas flow intensity of landfill will be reach to 290 m³ if gas collection network isn’t extended.
5- Collection Network and Gas Transfer line of Landfill

Duty of collection network is to extract biogas from landfill and conduct it to transfer line. Duty of transfer line is to carry collected gas to Gas Refining and Pressure Strengthening Station.

There are 26 tubing lines for gas collection operation in length of 1500 m in this project. Main pipes in transfer line have been by poly ethylene with high density (maximum authorized pressure is 6 atmospheres). Also, Drip trap that is responsible to separate and discharge distilled drips on internal wall of gas pipe from gas flow of landfill has been expected in this system. Currently, amount of gas collection is 400 m³/h.

Amount of methane that is available in obtained gas is between 50% and 60% that is a proper criterion to use in biogas consuming engine.

6- Gas Refining and Pressure Strengthening Station

Gas Refining and Pressure Strengthening Station in capacity of 600m³/h has been installed by Vander Weil in Netherlands. This complex includes as following:

- Separator of liquid and suspension particles
- Gas Compressor
- Dehumidifier or Gas dryer
- Reactor of Removing Pollutants
- Taps to sample Gas
- Gas Measurement Devices