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Kazan (Ankara) is a New Geothermal Area in Turkey

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ABSTRACT

Kazan geothermal area is a new geothermal area and it is located very close to Esenboga airport, an important region in terms of tourisim and economy. A geothermal area has been discovered through geological, tectonical, hydrogeological and geophysical studies performed by Iller Bank geologists and the first geothermal well, depth of 400 m, was drilled. Due to the variety encountered in the first drilling, and following research conducted by the company Jeoson a location of 5 new wells were determined. The problems encountered in first well were solved and hot water, 38.5°C temperature and 0.35 l/s yield, was obtained from IKJ-1 well depth 220 meter. Depth of the wells ranges between 220 and 496 meter, temperatures varies from 29 to 55°C and the yield ranges between 7 and 60 l/s. According to medical evaluation hot water obtained from wells has bicarbonate, carboniocside, florur, silisium properties and drinkable, balneological water. These waters cure a lots of disease and it can be used as protection from some diseases and improve human health. In the area a modern Thermal Hotel and Congress Center has been established to tourist and curists as a therapy and human health.

1. INTRODUCTION

Kazan is located 46 km northwest of Ankara and it is next to the Ankara-Istanbul Highway. In the county there is continental climate conditions and average rainfall per year is 350-400 mm. The studied area is a new geothermal field in Turkey because it is covered with sedimentary units and there isn't any hot water spring in the area.

2. GEOLOGY

There are respectively from older to young units in the studied area which are Miocen and Pliocen aged units giving outcrops. These consist of respectively from sedimentary and volcanic units. These formations named as Pazarlar Formation consisted of conglomerate, tuffs, silisifie limestone and Sinap Formation consisting of conglomerate and sandstone. The youngest unit is Quaternary alluvium. The hot water reservoir is in conglomerate, sandstone and agglomerate of the Pazarlar and Sinap Formations. It is considered that the cap rock is impermeable tuffs and clays units in the same formations. Faults in the studied area shows lineament in the northeast-southwest direction, and these are generally normal faults.

3. EXPLORATION AND DRILLINGS

In the studied area, electrical resistivity and radon soil measurements were carried out. Nine geophysical measurements (Resistivity method -Vertical Electrical Sounding) were performed. AB/2 distance is selected to be 600-700 as an exploration depth. Also soil radon gas measurements were made at 27 points due to identify fractures zones underground. As a result of these explorations, an exploration geothermal well, IKJ-1, was planned at 400 meter. Some drilling problems have been encountered on the first well in studied area, so drilling was ended at 220 m. Additional studies were conducted in the field and five geothermal well locations were identified to be drilled. In each of them cold water inlet caused a decrease to 29 °C temperature at approximately at 136 - 230 meter depth, so these depth were closed through drilling and the temperature increased. Geothermal properties of wells are shown in Table 1 and 2. Well tests and measurements have been performed with high efficient pump in all geothermal wells and there isn't any hydraulic interaction between IKJ-3 and IKJ-5 wells.

Table 1- Geothermal Properties of Drilling Wells

Well No	Depth (m)	Coordinates (UTM ED50)		Temperature (ºC)	Yield (l/s)	Static level (m)	Dynamic level (m)
		Y	X				
İKJ-1	220 m	467859	4454442	38.5°C	0.35 l/s	36	132
İKJ-2	252 m	467846	4454285	29°C	7 l/s	+0.5	
İKJ-3	396 m	467645	4454500	50°C	35 l/s	41	64
IKJ-4		467085	4454808	Not completed			
İKJ-5	460 m	467609	44454509	55°C	60 l/s	47	68
İKJ-6	496 m	467163	4454525	43°C	60 l/s	61	78

Table 2- Lithological units in geothermal wells

Well No	Depth (m)	Lithology
IKJ-1	0-9	Sedimentary units (clay)
	9-92	Tuffs
	92-383	Volcanics (andesite, tuff, agglomerate)
IKJ-2	0-73	Sedimentary units
	73-252	Volcanics (andesite, tuff, agglomerate)
IKJ-3	0-73	Sedimentary units
	73-396	Volcanics (tuff, agglomerates)
IKJ-4	0--14	Alluvium
	14-210	Volcanics
IKJ-5	0-2	Soil
	2-460	Volcanics
IKJ-6	0-3	Soil
	3-10	Alluvium
	10-444	Volcanics
	444-492	Limestone

Figure 1 Google Earth image of geothermal wells locations.

4. DIRECT USE AND BALNEOLOGY

Water samples taken from the wells were analysed in laboratuaries of The Ministry of Health Sanitation Institution and Hydroclimatology Department of Istanbul University. Their radioactivation analysis were done by TAEK (Turkish Atomic Energy Authority). Thermo mineral water is classified bicarbonated, carbon dioxide, fluoride, silicon as special balneologic potable water. It is reported in the medical evaluation report that it is good for diarthrosis and rheumatismal diseases in the form of aquatic exercises and gastroenterological diseases by drinking and it is good for bone development based on its fluoride content as well. It is also indicated that it would be used for protecting and improving the health, diseases effectively therapeutically.

Thermal Hotel and Congress Center planned to be built with traditional Selcuk architecture will have 2 presidential suits, 6 executive suits and 255 room capacity. Besides indoor and outdoor swimming pools, there will be also a SPA center, fin bath, Turkish bath, private family jacuzzi and clay, salt masks and solarium rooms. It is planned that the center will be open at August in 2015.

Figure 2 Geothermal drillings

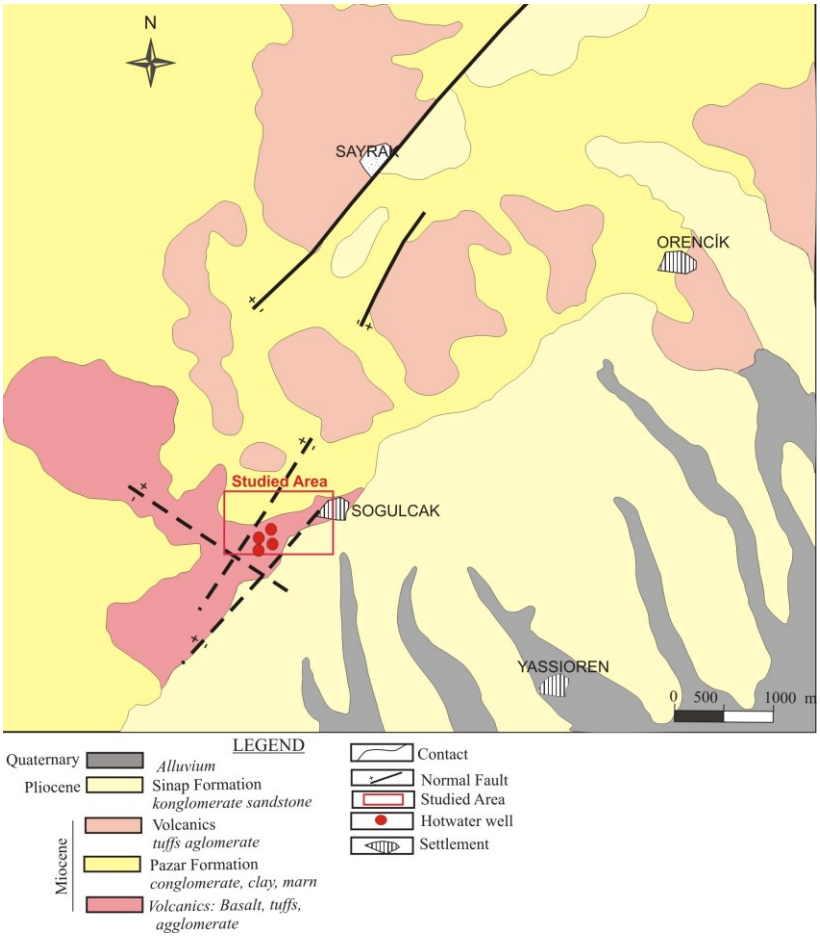

Figure 3 Geological map of studied area

5. CONCLUSIONS

Kazan Geothermal Area is new discovered area. Because of that reason, geological, hydrogeological, tectonic, geophysics surveys and drillings are continuing to defined the potential of geothermal area.

There are five wells and their depths are between 220 m and 496 m and their tempature is between 29-55°C. Discharge of geothermal fluid obtained from the opened wells is 162 l/s. It is sodium-bicarbonated fluid and it is good for protecting and improving the health and therapeutical for disaeses with various bathing and drinking practices.

Kazan Geothermal Area is near Ankara and one hour away from Esenboga Airport. Therefore, this area has importance with regards to thermal cure and tourism.

Some part of the hot water obtained from geothermal wells (20 l/s) will be delivered through geothermal pipelines to Kazan and used for Thermal hotel, thermal therapy center and thermal springs located near the entrance of Kazan and rest of the hot water will be used for swimming pools that made by Special Provincial Directorate of Administration.

Projects regarding the establishment of greenhouses is still proceeding.

To establish Physiotherapy and Rehabilitation centers for therapeutic purpose should be encoureged in the province.

Figure 4 Thermal Hotel-Congress Center

Figure 5 Public Thermal Center (right)

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