Geothermal Exploration of the Reykholt Thermal System in Borgarfjörður, West Iceland.

LÚDVÍK S. GEORGSSON (1) HAUKUR JÓHANNESSON (2) EINAR GUNNLAUGSSON (3) GUDMUNDUR INGI HARALDSSON (1)

(1) National Energy Authority, Grenssásgur 9
108 Reykjavík, Iceland.

(2) Icelandic Museum of Natural History, P.O. Box 5320,
105 Reykjavík, Iceland.

(3) Reykjavík Municipal District Heating Service Drápuhlíd 14,
105 Reykjavík, Iceland.

ABSTRACT

The Reykholt thermal system covers an area of 250-300 km² in the valleys of the Upper Borgarfjörður region. The natural discharge is equivalent to about 400 l/s of boiling water. It is the largest low-temperature thermal system in Iceland. It comprises all the largest thermal fields in Borgarfjörður, incl. the Deildartunga-Kleppjánsreykjar, Húrdarbak-Stöumulí and Vellir fields. The highest base temperature is at the Reykholt-Kópareykjar thermal field where it exceeds 140°C. The temperature decreases in all directions from the centre.

The thermal water is of meteoric origin and has fallen as precipitation on the Arnarvatsheidi highlands. It percolates down to a depth of 1-3 km and is heated by regional heat flow. It flows laterally for about 50 km to southwest, driven by the hydrostatic gradient. The main aquifers appear to be permeable northeasterly faults and occasionally dykes. They are intersected in the low-lands by open northwesterly to northerly trending fractures which enable the hot water to flow to the surface.

INTRODUCTION

The Borgarfjörður thermal region in the valleys of Upper Borgarfjörður (Fig. 1) is the largest low temperature thermal region in Iceland; the second being the South Iceland thermal region (Saemundsson and Fridleifsson 1980). These two regions are adjacent to the Reykjanes-Langjökull axial rift zone bordering its western and eastern margin, respectively. The natural discharge of the hot springs in the Borgarfjörður region is estimated to be equivalent to about 450 l/s of boiling water.

The Borgarfjörður thermal region has been divided into five separate thermal systems mainly on the basis of the results of a resistivity survey and the chemistry of the thermal water (Jóhannesson et al. 1980, Gunnlaugsson 1980). These systems have been named after their centres: Reykholt, Baer, Brautartunga, England and Húsfell. Each system comprises a few to numerous thermal springs or spring clusters. The hot springs are often distributed along lines. One thermal field may include more than one line of hot springs. The Reykholt thermal system is by far the largest system in Borgarfjörður. It comprises many thermal fields along with numerous minor hot and warm springs.

The thermal activity in the Borgarfjörður region has in the past attracted the attention of many scientists, who have tried to explain its origin and relate the distribution of hot springs to tectonic structures. Thoroddsen (1891) was the first to map the hot springs in the Borgarfjörður region. He suggested that they were aligned along semicircular faults demarcating the Faxaflói bay depression.

Einarsson (1937) mapped the main geological features around the hot springs in Reykholtsdalur and suggested that the hot water ascended along