

SOLUTION PARTNERS

ENERGY ENGINEERING and R&D



Buderus

VIESMANN

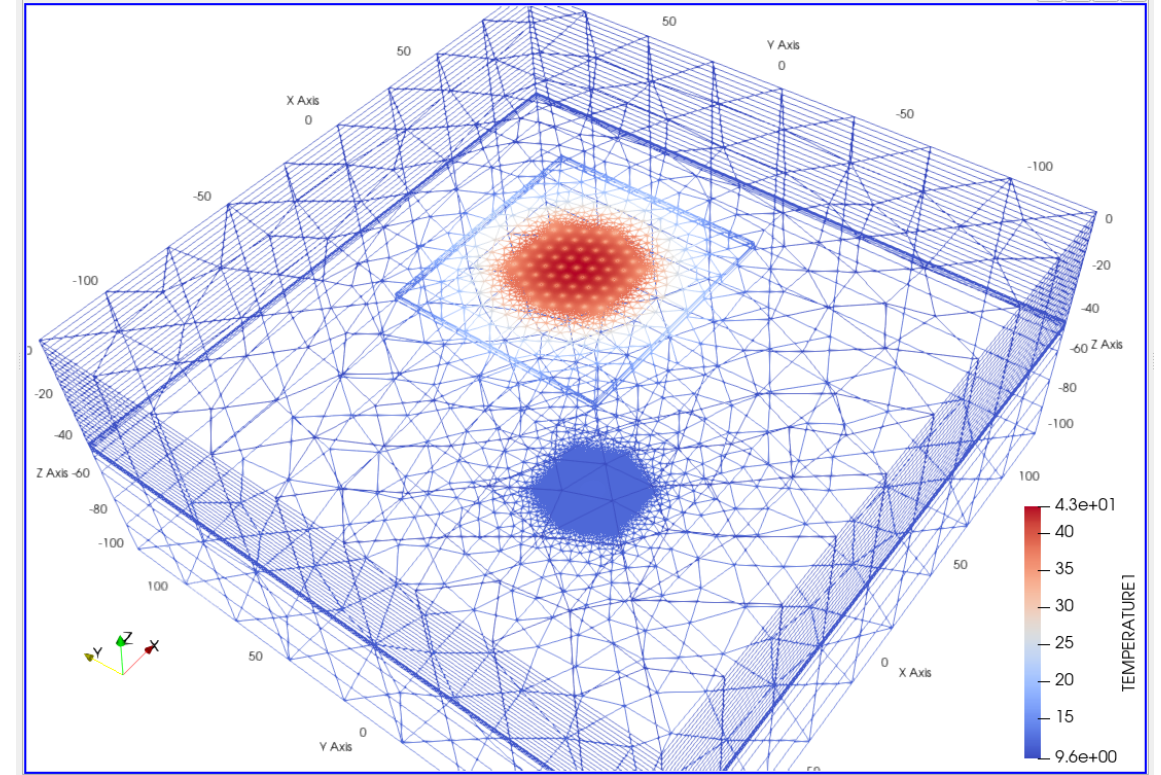
ITT

Enerji, Mühendislik ve Araştırma



DemirDöküm

**BORUSAN
MANNESMANN**



Long Term Solar-Ground Heat Storage Modeling

- Heat Pumps (Ground, water, air etc. source)
- Natural Gas, heating, cooling solutions
- Thermal Response Tests
- Physical modelings, simulations

CONTACT

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ITT ENERJİ
MÜHENDİSLİK VE ARAŞTIRMA

Services

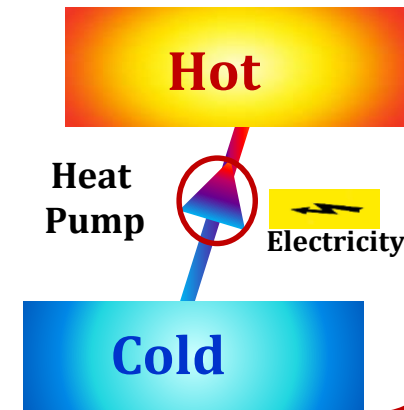
HEATING & COOLING

Heating and cooling solutions for industrial and residential buildings.



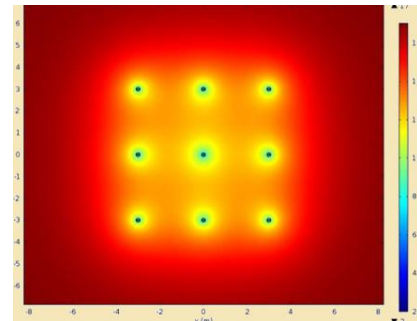
HEAT PUMPS

Ground, water and air source Heat Pumps applications. Ground is cooler than air in summer and warmer than air in winter, therefore Ground Source Heat Pumps can provide higher efficiencies.



MODELINGS

Temperature and flow modelings. Short-term and long-term performance analysis. Design calculations.



THERMAL RESPONSE TEST

- For GSHP applications borehole tests, temperature profile of ground, thermal conductivities, thermal resistance of borehole.
- Total borehole length, allocation of boreholes in an application field.



References

Some References

HEATING & NATURAL GAS

1	BIÇAKCILAR A.Ş.	ESENYURT	Factory all NG project
2	ACARKENT B809	BEYKOZ	Project & Application
3	ACARKENT B409	"	"
4	ACARKENT B110	"	"
5	ACARKENT B199	"	"
6	ACARKENT PİNGU ANAOKULU	"	"
7	ERDEDE FABRİKASI	SİLİVRİ	Project
8	GÜL-AL A.Ş. KIA ÜMRANIYE	"	"
9	ÜMRANIYE DEMİR ÇELİK A.Ş.	"	"
10	RAM GAYRİMENKUL	ETİLER	16 units projects
11	FCA İNŞAAT A.Ş.	MALTEPE	150 units projects
12	D'S DAMAT YENİ BİNASI	İKİTELLİ	Project & Application
13	AGER YAPI	BOSTANCI	Project
14	AĞCAOĞLU	ÜMRANIYE	"

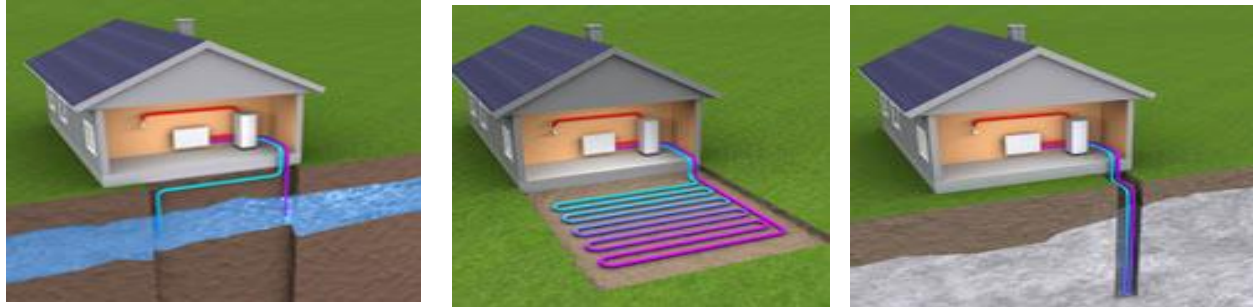
HEAT PUMP, Ground,Water Source HPs, Thermal Response Test

1	BALIKESİR UNIVERSITY	TRTs on RESEARCH BOREHOLE	
2	INOVA A.S.	HORIZONTAL GSHP	
3	SADULLAH PASA	BOSPHORUS SOURCE HEAT PUMP	
3	ŞÜKRÜ DİNÇER HOUSE	KEMERBURGAZ GSHP with vertical GHE	
4	AHMET SELVİ HOUSE	"	GSHP with hor. GHE
5	ÖMER DİNÇER HOUSE	"	GSHP with vertical GHE
6	E.S.TUNCER HOUSE	HADIMKÖY	GSHP with hor. GHE
7	İTÜ ENERJİ CLASSES	SARIYER	GSHP ver.+hor. GHE

SPECIAL PROJECTS

1	İTÜ	MASLAK	TRT in 6 borehole ~ 50 tests
2	SOLOPLANT GREENHOUSE	YALOVA	Test, GHEs modeling

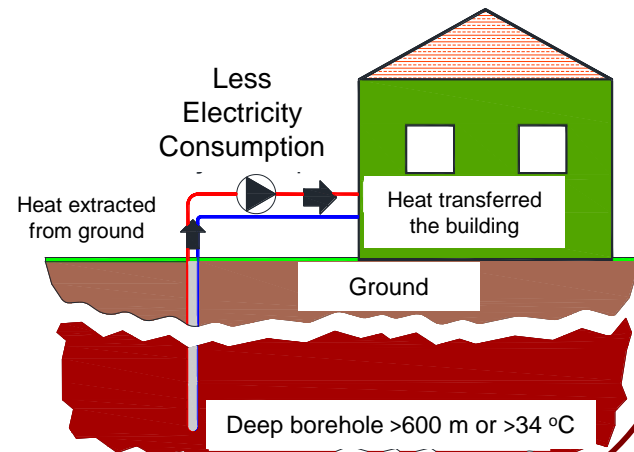
Ground, water and air source heat pumps



Ground Source Heat Pump and Passive Heating

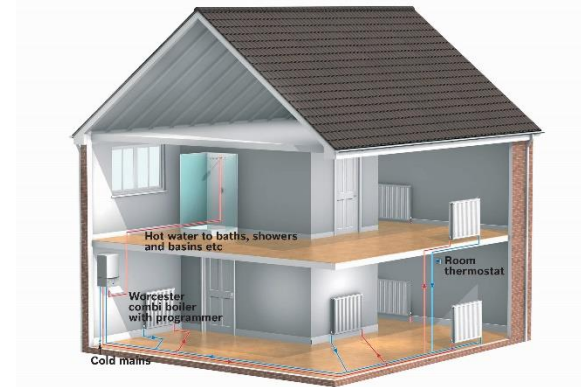


Passive Heating

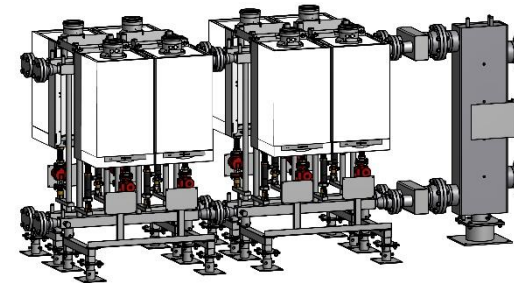


Combi Boiler applications

Industrial Solutions



Combi Boiler cascad applications



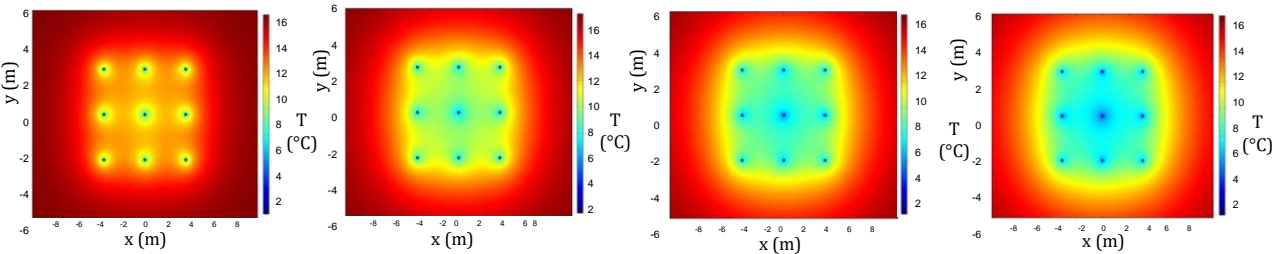
Comparison of unit heat energy productions from different sources.

Heat Source	Heat Value	Unit Cost	Eff.	TL/1000 Kcal
Natural Gas (Resid.)	8250 kcal/m ³	1.0109 TL/m ³	90	0.1362
Lignite (Import)	6000 kcal/kg	0.7118 TL/kg	65	0.1825
LPG	11000 kcal/m ³	4.4642 TL/m ³	90	0.4509
Electricity	860 kcal/kWh	0.3104 TL/kWh	99	0.3647
Ground Source Heat Pump (COP=4.5)				0.0801

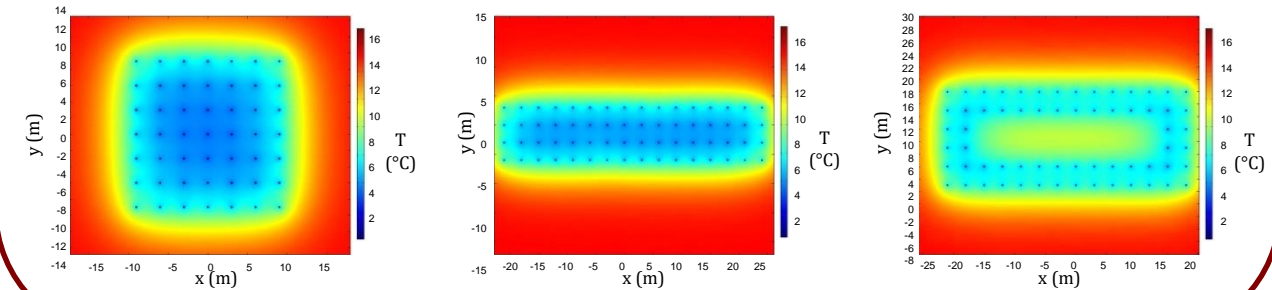
Source : Istanbul Natural Gas Distribution Co.

Modeling Studies

Different Modeling Studies

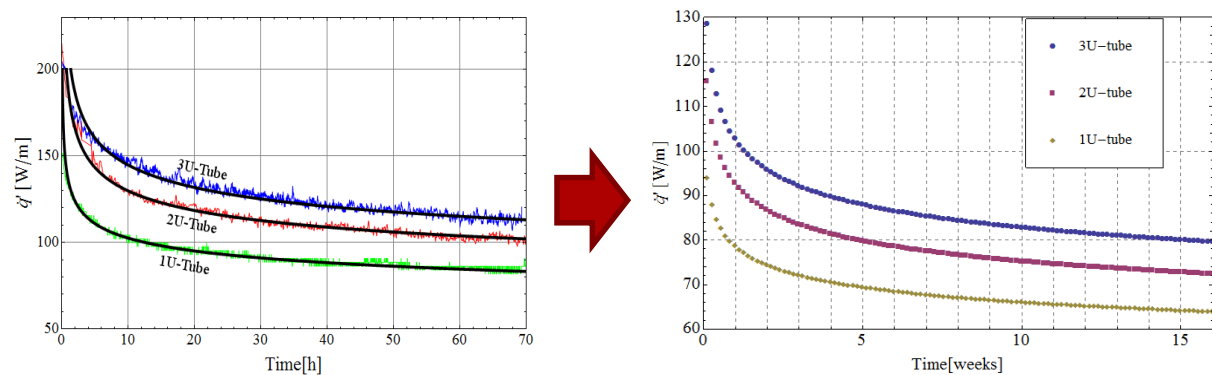


Time dependency of ground temperature for 9 boreholes



Different borehole allocations

ENGINEERING DESIGNS AND PERFORMANCE ANALYSIS



In Ground Heat Exchangers long term performance analysis.

Thermal Response Test

MOBILE THERMAL RESPONSE TEST DEVICE

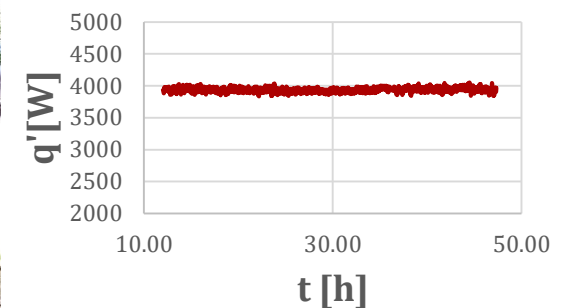


Constant heat flux and constant temperature and other functional tests of boreholes.

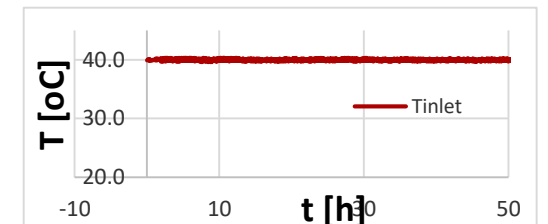
Suitable ASHRAE and IGSHA standards.



A sample cons. Heat test



A sample cons. Temp. test



A sample functional test (f(T) , f(q'))

