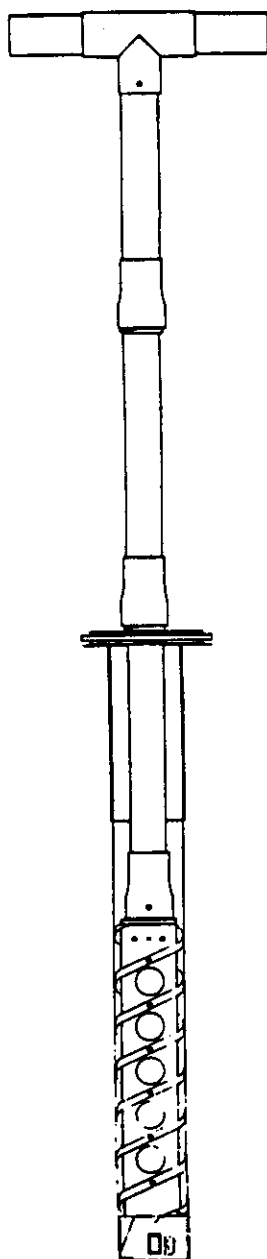


Development of a Solar-Powered 40-m Drill

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High altitude use of the PICO hand auger to depths approaching 40 m is enhanced by the use of a powerhead preferably driven by a solarvoltaic power source. Feasibility of this system was demonstrated in 1981 near Dye 3, a DEW line site in Greenland, when a 250-watt array of solar panels was used to supply power to an electrically-driven powerhead. The cumulative time required to reach 40 m with two people was 12 hours.

The use of an electric powerhead and tripod provides constant speed and penetration control resulting in good core quality. In contrast, the start-stop rotation provided by hand operation and full weight of the drill string on the bit results in core damage, particularly in the upper layers of firn.

Design of this system relies on standard hand auger components and drive mechanisms adapted from the PICO electromechanical drills. Table 1 lists the basic components of the system. The solar powerpack provides 500 watts of power when used over a snow surface (Table 2). DC voltage is supplied to a permanent magnet DC motor through a variable resistor which is used to control rpm. (See Table 3 for operation parameters of the motor and gear reducer.) Meters are provided to monitor performance.

Operation of the drill is identical to the standard hand auger¹. A parts list and cost are available from B & B Enterprises or from PICO.

Table 1. Basic components of the system

List of Materials	Estimated Cost
50-m PICO hand auger with tripod	\$ 8,000
500-w solar panels	3,000
Tracker	1,000
350-watt DC motor (gear reducer)	2,700
Machining cost	1,000
Options	
Graphite extensions	add 6,500
3-flite auger and head	add 1,000

¹B & B Sales, Dorchester, NE

Table 2. Typical solar panel parameters

#Watts/panel	#Panels	Volts	Amps	Cost (U.S. \$)
60	6	51.3	7	\$2,500
		34.2	10.5	
	8	68.4	7	3,300
		34.2	14	
30	8	35.6	7.1	3,000
	10	35.6	8.9	3,500
	12	53.4	7.1	4,600
	16	71.2	7.1	5,700

Table 3. Typical motor gear reducer parameters

Volts	Amps	Torque (in lb)	Rpm	Wt (lbs)	Cost
60.9	8.5	400	75	21	\$3,000
63.5	8.2	410	75	24	3,000
35	7.5	274	50	10.8	2,000