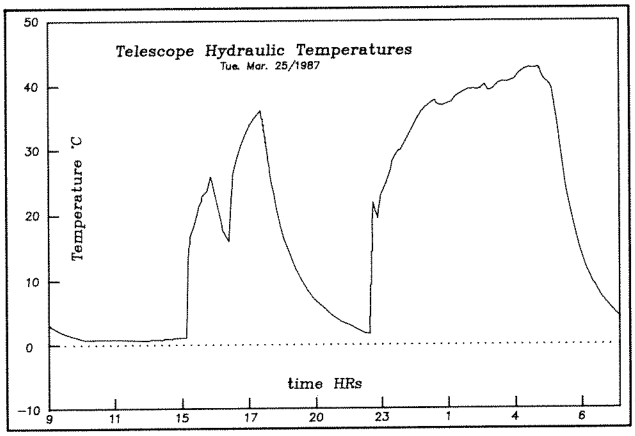
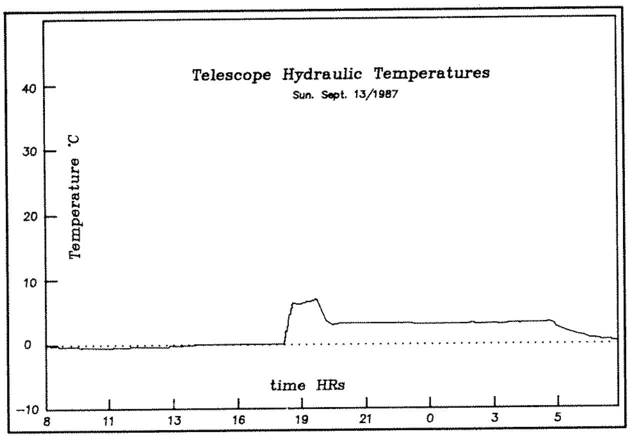
Telescope Hydraulic Modifications

The telescope hydraulic system has been modified to use a chilled fluid and has been successfully operating now for over 6 months. This system is used to support the telescope on hydrostatic bearings. The two graphs show the temperature of the fluid in March prior to the implementation of the new system and the temperature in September with the new fluid.





Figures 10a and 10b.

The system was modified to reduce the heat flowing into the dome specifically from the hydraulic fluid. It has been reported in the literature that seeing or image quality of a large telescope degrades in the order of 0.05 arc seconds per kilowatt of heat being dissipated within the dome environment. Typically with the previous fluid, 10 to 15 kW of heat were being dissipated. With the new fluid the environment absorbs less than 1 kW of heat.

The modified system uses a synthetic hydraulic fluid that has about the same viscosity at 0°C as the original had at 30°C. In the original system the telescope structure acted as the fluid chiller and the fluid gradually rose in temperature as the telescope was heated. In the new hydraulic system the fluid is chilled with fluid chiller using glycol from the chiller system. The temperature of the hydraulic fluid is controlled accurately with a proportional control valve.

The hydrostatic bearing gaps with the new fluid are generally greater than they were with the original fluid and are approximately what was specified in the original design. The gap does not vary during the night. Previously the gaps became smaller as the fluid rose in temperature due to a drop in viscosity.

Seeing statistics will tell us in the near future the impact of removing a major source of heat inside the dome.

The efforts of the Day Crew and technical staff of the corporation where a major factor in the success of this project.

D. Cowley

Energy Consumption at the Telescope

Early improvements in seeing at CFHT (1982-84) resulted mainly from eliminating unnecessary heat sources and controlling airflows into the 5th floor observing area. Such campaigns continue these days as equipment, people and priorities migrate through the building, seeking the ultimate in quality of scientific results. However, as these fixes tend to be non-repeating events, the gains to image quality are harder to come by; one often must spend energy to further improve the seeing. It might thus be expected that as seeing improved from about 2 arcseconds in '81 to about 1 arcsecond in '84, the control of heat sources would also result in reduced energy usage at the telescope.

In fact, as seen in Figure 11a, the average daily kilowatt-hours used rose from about 2400 in Mar '81 to a rather lofty 3600 in May '85. Obviously, contributions to seeing improvements occurred despite higher energy consumption, with much of this extra heat being inefficiently utilized. Prompted by these trends, in mid-'85 we set an operating objective: to stabilize the power usage at the summit, leading intuitively to a better seeing environment, while concurrently saving considerable money.

As shown in Figure 11a, this program produced an initial rapid drop to under 3000 kwhrs per day, reached in Oct '85, followed by a continued improvement to Oct '87 values of 2700 kwhrs per day. This almost 25% reduction was made by:

- reducing the cooling of the observatory floor, thus raising Level 5 temperature from -10°C to ≈0°C. (This appears to have no deleterious effect on seeing.)
- reducing electric heater thermostat settings throughout the building, limiting maximum temperatures to 18°C.
- reducing lighting consumption by lowering levels where possible, using more efficient fluorescent fixtures, plus installing room sensors to shut off lights when unoccupied.