for the test and evaluation. How good and how valid it is depends on how objective and realistic you are.

OTHER FACTORS

An evaluation of this nature is not designed to blackball any product or company. Conversely, it gives new suppliers an objective and fair appraisal of how their products compare with others. It indicates in some detail where products may be weak or superior. It permits suppliers to upgrade faster and more positively.

Under such circumstances we take the attitude that competition makes for better products as well as better prices and services. If a new product appears on the market, we say to our staff, "Let's see what we can do to make this product work and make it better." It is more than a matter of giving a new product a fair break; it is a matter of improving and helping it to develop. If it makes the grade, it will inevitably contribute in some way to improving the products we are using today.

Standardization is fine, but having only 1 or 2 products to choose from is not good. It stifles development and sometimes leaves the purchaser at a disadvantage.

George W. Heinle, Southern California Rapid Transit District, Los Angeles

The Southern California Rapid Transit District was one of the first to get involved with the small transit vehicle. When we first embarked on our small vehicle venture more than 3 years ago, few vehicles and alternatives were available on the market. The project was not strictly a DRT operation, but the vehicles used to provide the downtown circulation system in Los Angeles are in our opinion most adaptable to a variety of similar services, including DRT operations.

The project was novel in a number of respects. It marked the first time that 4 Los Angeles public agencies came together and agreed to share the cost of providing this type of service. The city of Los Angeles, the county of Los Angeles, the Community Redevelopment Agency, and the Southern California Rapid Transit District all agree to bear a part of the cost. The 3 other agencies shared the operational costs, and SCRTD purchased the vehicles. We had to develop specifications and get vehicles operating quickly because, once the public financed and supported this program, it wanted to see some action.

Therefore, we bought minibuses because we had to consider an "on-the-shelf" bus that would provide the kind of service and give the type of aesthetic appeal that we wanted. Some of the criteria that we developed included low steps for easy access by the aged and infirm, seats arranged for ready access, and natural circulation toward a rear exit door. We also wanted a sturdy, rugged small bus that had an ecologically acceptable power plant.

At the same time, we could not design a completely new vehicle and expect the operation to commence within a short period of time. So that emissions would be minimized, we decided to use natural gas as the regular fuel and gasoline as a backup fuel. The dual fuel system provides for using either gasoline or compressed natural gas. We would have used liquified natural gas, but it was not available in Los Angeles. Our estimates indicated that the compressed natural gas would be just barely sufficient with five 375-ft^3 (10.6-m^3) tanks to obtain a range necessary for our regular route operation from 9:00 a.m. to 4:00 p.m. Therefore, the gasoline backup was necessary.

We also tried to incorporate in the specifications features that would make the vehicle more durable and minimize maintenance needs. In this respect, we were only partially successful. We were able to develop, along with the Herz Erhardt Company, disk brakes that were applicable to the Dodge chassis and were a substantial improvement over the standard drum brakes.

Innovative design features in the buses were an exit door at the extreme rear of the right cantilever, perimeter fiber glass seats in vibrant colors, and no seat legs in the aisle area, removing tripping hazards and providing space for storage of packages under the seat. The arrangements contributed materially to the smooth operation of the service and the exceptional passenger acceptance.

Some of the mechanical problems that we have experienced with these vehicles are the result of heavy passenger loads that the service has attracted. Often during the noon hour as many as 50 people crowd on these 21-seat buses at one time. The air over hydraulic disk brakes have excellent stopability, but the passenger loads and the frequent stops necessitated by the downtown traffic have shortened the life of the brake linings. The average lining life is about 7,500 miles (12 000 km). As a result of this experience, we have developed a larger, more durable disk brake, which will be incorporated into buses that we currently have on order.

The dual fuel engine also proved to be a problem. The changeover from one type of fuel to another while in service frequently stalls the vehicles. This contributed to a problem with the starters, which apparently were already borderline as to their capacity. The dual fuel arrangement also necessitated a compromise in the engine timing, and thus fuel mileage is not what it should be since it is not possible to set the timing at the most desirable point for either fuel.

Furthermore, the compromise causes the engine to run hotter than it would under optimum adjustment, and overheating has been extensive. This problem has been partially resolved by replacing the original radiators with ones of a larger capacity.

Radiator troubles also abounded because of the heat problem; gaskets deteriorated, floats became distorted, and engines were hard to start. The excessive engine heat also has had an adverse effect on transmission seals, and transmission life has not been what we expected.

We have developed through our experience a preventive maintenance program. A lubricating, oil change, and normal fluid collection and engine check are done every 3,000 miles (4800 km), and a major inspection is performed every 6,000 miles (9600 km). Brakes are visually checked for lining thickness once weekly. Our maintenance costs for these vehicles are now averaging 13.68 cents/mile. This compares to a fleet average for the 45- to 50-passenger buses of 11.53 cents/mile.

On the other hand, the average overall speed on this heavily congested downtown route is only 7.5 mph (12 km/h). The average standard bus speed throughout the southern California area is 13.2 mph (21 km/h). Obviously the slow operating speed affects costs. If the vehicles were used in a less congested area and had lighter passenger loads, I am certain that the maintenance costs per mile could be reduced from 20 to 30 percent.

SCRTD now operates the buses a greater number of hours daily than originally intended; some of the buses provide shuttle service during the peak hours from the perimeter downtown parking lots. The gasoline backup system has had to be regularly used. Natural gas consumption has averaged more than 4 miles/100 ft^3 (6 km/2.8 m^3) of compressed natural gas, and gasoline consumption is 2.6 miles/gal (4 km/3.8 liter). If used for DRT, the vehicles would show a substantial improvement in fuel consumption.

After 3 years of experience with these vehicles, we have developed new specifications that provide for substantially larger, heavy-duty brake systems and fuel systems for propane gas or other nonfossil fuels.

When we purchased 40 buses in 1974, the successful bidder proposed the use of propane engines. The buses also have a heavier duty radiator with that internal combustion engine, more cooling capacity, heavier duty starters, heavier duty shock absorbers, and changes in the suspension to get a smoother ride.

The 19 buses that have been in service for more than 3 years will have to be completely rebuilt. After that we will use them for an expanded DRT service in some of the more remote communities in the Los Angeles basin.