



TRAQ Technical Overview

Transportation Air Quality Center

Transportation Control Measures: Work Schedule Changes



EPA's main strategy for addressing the contributions of motor vehicles to our air quality problems has been to cut the tailpipe emissions for every mile a vehicle travels. Air quality can also be improved by changing the way motor vehicles are used—reducing total vehicle miles traveled at the critical times and places, and reducing the use of highly polluting operating modes. These alternative approaches, usually termed Transportation Control Measures (TCMs), have an important role as both mandatory and optional elements of state plans for attaining the air quality goals specified in the Clean Air Act. TCMs encompass a wide variety of goals and methods, from incentives for increasing vehicle occupancy to shifts in the timing of commuting trips. This document is one of a series that provides overviews of individual TCM types, discussing their advantages, disadvantages, and the issues involved in their implementation.

Work Schedule Changes

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Work schedule changes or variable work hours is one transportation control measure which may effectively reduce congestion and improve air quality. Work hour policies are determined by employers, who are therefore the key entity in making work schedule changes. Three implementation options—staggered work hours, flextime, and a compressed work week—are discussed below.

1. How It Works

- ➔ **Staggered work hours** allow employees to begin work in intervals across the morning. Start times may be 15 minutes apart throughout the morning, and employees are required to work for eight hours from their start time. The goal of this transportation strategy is to spread a given amount of traffic over a longer period of time around peak periods, which reduces concentrations of ozone precursors.
- ➔ **Flextime arrangements** allow employees to select their arrival and departure times. These have much the same impact as more structured staggered work hours: reduced peak hour congestion and potentially reduced air pollution. More flexibility in scheduling may allow some employees to rideshare who would be unable to otherwise. The fact that fewer people are arriving at the same time may discourage some ridesharing as well. The first documented flextime program was established in 1967 in West Germany. Since then, flextime programs have become prevalent in many organizations around the world.
- ➔ **Compressed work weeks** allow employees to work more hours in fewer days than the usual 8-hour per day schedule. The “4/10” work week is a common option in which employees work 10 hours per day over four days. Another common approach is the 9/80 work week which occurs over a 2-week period as follows: employees work seven 9-hour days in a 2-week period, one 8-hour day and then receive one “free” day off every other week. Work schedule changes may improve air quality and reduce congestion. There will be fewer vehicle miles traveled across the work week and employees will be arriving and departing during non-peak periods, thus reducing concentrations of ozone precursors.

Because the three measures discussed above are similar in their costs, benefits, and implementation, they will be broadly considered in this document as one transportation control measure -- work schedule changes.

2. Costs and Benefits

The goal of instituting these measures is to reduce congestion during peak traveling times and to improve air quality. Effects on the latter are difficult to assess, but case studies indicate that changes in work schedules can reduce the volume of peak traffic. In one test in San Francisco in which 6,000 employees from 23 different

companies participated in a flextime program, 60 percent indicated that they experienced “much less congestion” on their way to work. The Arizona Department of Environmental Quality estimated that voluntary alternative work schedule programs would reduce maximum 8-hour carbon monoxide emissions by as much as 1.9% in the Phoenix metropolitan area, assuming that 20 percent of the regional employees participated. [1]

As a result of work schedule changes, workers may become more productive and experience improved morale, while employers may gain from decreased absenteeism, tardiness, and turnover.

Implementing work schedule changes may result in benefits to both employees and the employers whose workers are participating in these changes. Workers may become more productive and experience improved morale, while employers may gain from decreased absenteeism, tardiness, and turnover. One company found that flextime increased productivity by three percent, and the program decreased sick time and personal leave an average of 3.5 days per year per employee.¹ Some companies have found unexpected benefits. For example, a State official reported that a Connecticut company increased market share of their west coast sales. Workers who were operating under variable work hours, stayed on the phones later in the evening and therefore reached more west coast buyers because of the time zone difference.

Employees may also benefit financially from work schedule changes by saving automobile operation and maintenance costs. If the work week is condensed into four days, each employee avoids the expense of two commute trips. Under flextime and staggered hours policies, commuting times can be decreased significantly, which saves money ordinarily spent on gasoline. Employees appreciate the opportunity to run personal errands and schedule doctor appointments without having to use vacation time or sick leave.

A potential cost associated with work schedule changes may result if the number of non-work trips increase significantly as a result of having a day off.

¹ Because of a State law maintaining confidentiality, the name of the company could not be provided.

The potential benefits of decreased vehicle miles traveled, improved air quality, and cost savings may be mitigated to some extent for people working compressed work weeks. If non-work trips increase significantly as a result of having a day off. It is possible, therefore, that although employees may benefit from driving on their day off from work, congestion and air quality may not improve significantly. Another potential cost is a reduction in ridesharing and transit use because of variable work hours.

However, many trips are likely to be taken during off-peak congestion hours so that the distribution of ozone precursors is spread out with a net result that ozone formation is reduced. One case study of a compressed work week policy concluded that total vehicle miles traveled decreased. In Denver, total vehicle miles traveled for work and non-work trips among participating employees decreased 15 percent. [2]

Some costs accrue to employers who institute work schedule changes. Time must be spent planning the program and explaining it to employees. Increased security and utility expenses also must be considered if the building's operating hours are extended. Additionally, there are potential costs associated with the disruption of work because some employees are unavailable.

In sum, work schedule changes may be cost effective if the costs described above do not outweigh the savings that employers and employees realize. One study showed that a variable work hour program pays for itself in a little over six years. Specifically, the costs to the employer to implement the program were matched by employee savings in about six years. [2] This study did not include benefits derived from decreased pollution.

3. Implementation

These policies may be voluntary, mandatory, or used by employers to satisfy trip reduction ordinances or air quality regulations. Programs, however, tend to achieve greater success and gain the approval of employees if they are voluntarily adopted by employers with employee input. There is evidence that workers prefer compressed weeks and flextime to staggered work hours, because staggered hours may shift some employees into a later arrival time that puts them in the middle of peak congestion. [3] This may result in employees experiencing greater travel time compared to their previous schedule.

Implementation of work schedule changes is relatively easy because there are minimal infrastructure costs, and approval from government is not required.

Work schedule changes are relatively easy to establish for several reasons. First, there are no infrastructure costs or up-front investments of government resources. Second, businesses may adopt these measures voluntarily and require no approval from government agencies. These factors allow work schedule changes to be implemented without businesses enduring a lengthy process of obtaining funds and government approval. These measures are also easily established because work schedule changes are easily explained and understood by employees.

Although work schedule changes are relatively easy to administer, careful planning and coordination is needed for the changes to be successful. The costs associated with planning and implementing the policies (e.g., labor hours used to plan the changes, increased security, and utility needs) must be compared with the potential savings that employees will gain. It is also important to consider the effect these policies may have on client relations and other departments within the businesses or agencies that are accustomed to the “old” work hours. In addition, businesses must ensure that the policies are consistent with union agreements. Key labor issues include the definition of overtime in a flexible schedule, and the method of recording hours worked. Many states have fair labor standards which govern the maximum number of hours employees may work without compensation for overtime.

4. Keys to Success

In order to increase the likelihood of success, businesses should coordinate the schedule changes with transit and ridesharing services. The schedules for these services may need to be changed as a response to new employee arrival and departure times.

Additionally, organizations may want to consider implementing a pilot program for three to six months before committing to the changed hours so that the policies can be evaluated in terms of employee morale, productivity, and financial ramifications.

It is important to note that not all variable work hour strategies can be implemented in every business setting. Information processing companies, for example, may be more able to rotate worker schedules and permit flextime policies. Organizations which rely heavily on process manufacturing and need all workers to be present at the same time to produce efficiently, have less flexibility. For manufacturing plants, a compressed work week policy is a much more suitable option than a flextime or staggered hours policy.

Another factor which may influence the success of a work schedule change is the geographic setting of the organization implementing the policy. Case studies indicate variable work hours are most effective where a large number of employees are affected and where the associated traffic is highly concentrated. For example, a compressed work week policy established at a large manufacturing plant may result in significantly reduced traffic during peak periods in the immediate vicinity of the plant.

Case studies indicate work schedule changes are most effective where a large number of employees are affected and where the associated traffic is highly concentrated.

5. Equity Issues

There are several equity concerns that need to be addressed when considering the adoption of a work schedule change policy. Not all companies nor all employees in any one company may be able to adopt any one of these policies.

6. Summary of Recent Examples

Case studies illustrate that work schedule changes mitigate congestion and therefore improve air quality. A staggered work hour program was initiated in downtown Honolulu where 11,000 employees (18 percent of the downtown work force) participated. Peak period travel time was reduced up to 18 percent, depending on the route commuters took. The study illustrated, however, that there are winners and losers under staggered hours: those leaving early from work saved the most in travel time, while employees who arrived at work later than usual actually lost travel time because they moved into the new peak period.

One prominent example of a successfully instituted compressed work week took place at a federal agency in Denver where participants arrived one hour earlier and departed one hour later than usual. In addition to the vehicle miles forgone by not working the fifth day, congestion was reduced during the four work days.

One example of a flextime policy took place in San Francisco where at least half of the participants arrived at work 30 minutes earlier than before the policy was initiated. By traveling before the main peak period, those traveling by car reduced their commute by nine minutes each way. Over a week, these employees saved an hour and a half in commute time. In this case study, over 60 percent of the participants reported having experienced “much less congestion” on their way to work. In the San Francisco pilot program, 6,000 employees across 23 companies participated.

One prominent example of a successfully instituted compressed work week took place at a federal agency in Denver where participants arrived one hour earlier and departed one hour later than usual. In addition to the vehicle miles forgone by not working the fifth day, congestion was reduced during the four work days. The maximum percentage of total arrivals in a half hour period was reduced from 56 to 42 percent, and the maximum half hour percentage of total departures also was reduced from 47 to 34 percent. In terms of air quality, it was estimated that average carbon monoxide and hydrocarbon emissions for employees were reduced by 16.4 percent. This carefully controlled experiment involved 9,000 federal employees from 42 agencies. [3]

7. Sources

[1] *Control Measure Evaluation*, Systems Applications International, San Rafael, CA (September 1990).

[2] *Transportation Control Measure Information Documents*, Cambridge Systematics, Inc., U.S. Environmental Protection Agency, Washington, D.C. (March 1992).

[3] Report to Congress, *Transportation Implications of Telecommuting*, U.S. Department of Transportation (January 1993).

8. An On-line Resource

The Environmental Protection Agency's Office of Mobile Sources has established the TCM Program Information Directory to provide commuters, the transportation industry, state and local governments, and the public with information about TCM programs that are now operating across the country. This document and additional information on other TCMs and TCM programs implemented nationwide can be found at:

<http://www.epa.gov/omswww/transp/traqtcms.htm>