Adaptive Traffic Signal Control (ATSC)

What is ATSC?
ATSC is the process by which the timing of a traffic signal is continuously adjusted based on the changing arrival patterns of vehicles at an intersection. During the process, a traffic signal provides green time to each intersection approach based on anticipated arrivals for adjacent intersections. As arrival patterns change from cycle to cycle, the length of green time provided to each approach also changes.

Why use ATSC?
The Federal Highway Administration (FHWA) released the Every Day Counts initiative to assist agencies and municipalities address congestion issues by identifying and deploying innovative technology that maximizes the usefulness of the existing infrastructure.

ATSC can be used as a method to reduce delays to the motoring public and extend the life of the current roadway systems by delaying the need to add capacity through additional travel lanes. Fewer delays also result in improved fuel efficiency and lower vehicle emissions, which have a positive impact on the environment.

How it works
First, traffic sensors collect data. Next, traffic data is evaluated and signal timing improvements are developed. Finally, adaptive signal control technologies implements signal timing updates. The process is continuously repeated internally by the system hardware/software. Then, the signals using ATSC share information with each other and make necessary adjustments to the signal timing parameters to keep traffic flowing smoothly.

Facts:
- According to the Texas Transportation Institute, the cost of traffic congestion is $87.2 billion in wasted fuel and lost productivity. That translates to $750 per traveler.
- Outdated traffic signal timing currently accounts for more than 10 percent of all traffic delays.
- When traffic signals are responsive to traffic demands, overall travel times are decreased.
- Average speeds improve when adaptive signal control technologies are used.
- Adaptive signal control typically improves travel time and delay by 10 percent and as much as 50 percent at locations with outdated signal timing plans.
- Within the United States, adaptive signal control technologies have been in use for roughly 20 years, though they have been deployed on less than 1 percent of existing traffic signals.
ATSC Benefits

- Continuously distribute green light time equitably for all traffic movements
- Improve travel time reliability by progressively moving vehicles through green lights
- Reduce congestion by creating smoother flow
- Effectively reduces traffic congestion, excess fuel consumption, and delays.
- Traditional signal timing design and maintenance is labor-intensive, adaptive signal control technology is handled automatically.
- Prolong the effectiveness of traffic signal timing
- Use real-time traffic data, allowing them to adjust signals to events that cannot be anticipated by traditional time-of-day plans, such as accidents and road construction.
- Maximizes the capacity of existing systems, ultimately reducing costs for both system users and operating agencies
- Environmentally friendly by reducing emissions of hydrocarbons and carbon monoxide due to improved traffic flow.

US 34 Adaptive Signal Timing
Colorado Department of Transportation (CDOT), Region 4

Atkins is working with CDOT Region 4 staff to design, install, and evaluate the effectiveness of adaptive traffic control technology at 11 intersections along US 34 Business (10th Street) in Greeley, Colorado. To improve traffic operations along the 10th Street corridor, the InSync adaptive signal system, which includes new video detection cameras at all approaches, and a wireless radio communication system that will allow the individual intersection controllers to communicate with each other and return video and data information to the City’s traffic operations center. InSync is a plug and play system, since it does not require the purchase of new software or controllers as it is fully capable of working with almost all existing signal operating systems.

Adaptive Signal System Evaluation
Colorado Department of Transportation, Region 2 and 4

CDOT Region 2 and Region 4 staff have requested that Atkins perform a comparative evaluation of adaptive signal systems being installed within the regions. Region 4 is implementing the InSync adaptive signal system at 11 intersection along US 34 in Greeley, while Region 2 is implementing the ACS-Lite adaptive signal system at 8 intersections along US 24 in Woodland Park. The evaluate will focus on comparing the results of the two systems to determine overall cost-benefits related to the installation and operation of the systems within the different regions. The goal of the evaluation is to present results that will facilitate Region 2 staff’s ability to determine whether or not to retain the ACS-Lite system or move toward a different system such as InSync. In addition, the results of the evaluate will help guide future decisions regarding implementation of adaptive signal system control on other highways within all CDOT jurisdictions.