Joint Academia and Transportation Industry Research Project Provides 
Keys to Future Traffic Management

Advanced Transportation Management System Project Receives 
Real World Recognition

Author: Eric Raamot, Econolite Vice President of Engineering

Introduction:

Even before the start of the 21st century, it was readily apparent that traffic 
congestion was a growing problem and a threat to centers of commerce 
and industry – negatively impacting the quality of life in both urban and 
rural areas. Moreover, as traffic problems continued to grow, the 
transportation agencies that were chartered with managing the roadways, 
in many cases, saw their resources and funding diminish. Further shining a 
spotlight onto this two-pronged problem, the National Transportation 
Operations Coalition (NTOC) issued the National Traffic Signal Report 
Card in 20051 (http://www.ite.org/reportcard/2005/default.asp) and 20072 
(http://www.ite.org/reportcard/2007/default.asp) with overall grades of “D-” 
and “D” respectively, which prominently illustrated across-the-board affects 
of ongoing transportation challenges, and what might come if immediate 
actions were not taken.

Understanding that many agencies do not have the resources to retime all 
intersections every one to three years, and that there was minimal system-
level information to begin identifying intersections that were operating on 
outdated timing, many in the transportation industry, including MPOs, 
realized that it is a necessity to establish a common toolset that identifies 
opportunities for traffic signal performance improvement. This is an 
important key to improving traffic conditions going forward.

As part of a larger signalized intersection performance measurement 
project, the Indiana DOT, Purdue University and Econolite collaborated to 
research intersection performance measurement, with a focus on 
identification of inefficiencies due to traffic signal programmatic errors, as 
well as, outdated signal timing programs. Additionally, this research 
program has the goal of identifying and productizing a new order of visual 
tools that will reveal new metrics of signal performance that traffic 
ingineers can immediately apply for signal timing optimization.

In 2003, Indiana DOT (INDOT) and Purdue University’s Engineering Road 
School initially embarked upon a traffic signal research study into the
Performance measures for signalized intersections. Historically, field data from signalized intersections were very limited in scope. In addition, signal controllers provided only basic measures of effectiveness (MOE) logging. These limitations created and maintained a substantial gap between collection of data and the generation of useable information that transportation agencies could effectively apply to update signal timing in response to changing traffic demands.

Transportation Industry Participation

With heightened national awareness of the NTOC’s report card, in 2006, Econolite participated in the research project by initially providing its ASC/3 signal controllers as a data logger, and then later providing its Centracs advanced transportation management system (ATMS). With the added capabilities of the ASC/3 controller, the research direction became more clearly defined. The project would now be able to define a set of signalized intersection operating parameters to uncover inefficiencies that will help agencies better focus retiming efforts. In addition, the data gleaned from the project would be leveraged in the development of commercialized systems that will better equip traffic engineers and agencies with the relevant tools to proactively enhance traffic system performance more cost effectively.

With INDOT’s expectation to eventually leverage the data and deploy the traffic signal system enhancement tools within the state of Indiana, the research program integrated Econolite’s Centracs ATMS as a commercially available centralized system that included the MOE and adaptive signal control software, as well as, the seamless communications with the controllers required to help drive the research and convert the data into user friendly and relevant information.

After the development of methodology was established, and performance measures defined, system specifications for ongoing performance measures, data collection and a centralized system were set. Data collection began, and analysis of before and after offset timing changes, as well as travel time impact.

City of Lafayette, Indiana:

One of the locations designated for system deployment of this research project is the City of Lafayette, Indiana – across the Wabash River from Purdue University. The City of Lafayette had the opportunity to take the
research further by deploying timing strategies and documenting MOE results by integrating 62 signals with the ATMS and upgraded controllers as part of a Federal Highway Administration (FHWA) project and an Energy Efficiency and Conservation Block Grant (EECBG).

In the summer of 2010, signal integration was completed through the FHWA project along several downtown arterials, including Veterans Parkway. By November 2010, through the EECBG funding, the ATMS was installed at the Lafayette Traffic Department, including communication integration with the downtown police surveillance camera network. By March 2011, the performance measures were uploaded to the ATMS software.

**Side Bar:**

The City of Lafayette and the engineering firm of Butler Fairman & Seufert won a 2012 Engineering Excellence Award from the American Council of Engineering Companies of Indiana (ACEC Indiana) for the ATMS project.

**Award:** Merit Award – American Council of Engineering Companies of Indiana

**Project:** Lafayette Advanced Transportation Management System (ATMS)

**Design**

**Owner:** City of Lafayette

The City of Lafayette has implemented a “central traffic signal system” referred to as the Lafayette ATMS. Users of the Lafayette ATMS are able to access 62 of the City’s 85 traffic signals from multiple computer workstations. The ATMS improves traffic signal operations and timings as data from the signal controllers can be accessed faster and more frequently. This translates into reductions of vehicle travel times, fuel consumption and vehicle emissions.

The ATMS is composed of new signal controllers, traffic count-capable vehicle detection, computer servers, and radio and fiber communication. A unique software package is used to interface with each of the traffic signal controllers. Financing for the project was provided by FHWA and Department of Energy (DOE) stimulus funds.

**Verifying Effectiveness**

As a result of the increased capabilities of the ATMS and controllers, the City of Lafayette traffic personnel are able to observe and adjust signal timing based on real time information. This has improved the efficiency of
its traffic personnel while actively improving conditions for its traveling public.

This joint research is representative of a successful collaboration between academia, transportation agencies, and vendors to standardize conceptual performance measures that identifies, assesses and provides the information necessary for timing adjustments to update and enhance traffic conditions with minimal resources. As a result of this project, the industry can use this model as a basis in enhancing future controller and system software to support this level of performance measurements.

The INDOT, Purdue and Econolite research project is expected to continue for at least an additional year with the City of Lafayette to further define ongoing performance measures.

Notes:


Captions:

File name:
Cityoverviewlarge: Separated by the Wabash River, the cities of Lafayette, Indiana and West Lafayette – home of Purdue University – used to experience their fair share of traffic congestion.

Lafayette_SignalMap: Signal map of Lafayette in Centracs ATMS.

Lafayette_SignalMap_Mainst_ScreenCap: Centracs ATMS provides simple and intuitive traffic management functionality.

Centracs_Monitor: A traffic management center monitor displays high resolution map capabilities of Centracs.