Greg Bremser’s article on Coordinating Traffic Signals in the July/August 2013 issue of the Journal caught my attention.

Anyone who has been watching FHWA’s website; or reading ITE literature; or attended TRB’s Traffic Signal System Committee meetings are well aware of the significant benefits achieved with good signal coordination. In this age of reduced budgets; do more with less; it is one way to make better use of the existing infrastructure and reduce driver frustration.

On the other hand, I frequently hear from agencies ‘but I don’t have the resources to update signal timings every 5 years let alone every 2 or 3 years’. Therein lies the disconnect between the theory and practise and so the challenges.

Conducting counts, running the analysis, installing the results and then fine-tuning the system takes time and resources. As a result, it is not done as frequently as it should be. Thus, I offer the opinion that a 75% solution is better than no solution at all!

Tools at our Finger Tips
Traffic controller manufacturers provide us with a tool to make the 75% solution possible – it is called the ‘Split Report’ – or something similar!

From the Split Report, we get to understand how each phase of the cycle is acting; for example does it gap out frequently or run to “max” all the time. This provides a clue of how the intersection is operating on a cycle by cycle basis.

Because of size, the above table only shows Phases 1 and 2. However the full report will show all 8 or 16 phases.

Note, this data is in its raw form. However, embedded is a goldmine of information. For each traffic cycle, the following data is normally collected:

- The start of the cycle date and time,
- The programmed and actual split times,
- The controller was in coordination or other modes,
- And possibly the programmed cycle length.

How could this data be used for signal timing purposes?

Faced with this question, I decided to build a simple Excel/VBA analysis program to categorize this information into something useful.

The first question was; what categories would be useful?

I came up with this list:

- Be able to select a time-period i.e. 6:30 to 9:30 in the morning,
- Be able to analyze one or two or three days. i.e. Tue, Wed and Thurs or maybe Saturday,
- How many cycles ran during this period?
- What was the split in effect?
- What was the average (mean) split value of all the cycles?
- If the split time was 30 sec and mean was 27 then this phase has high demand,
- If the mean was 12 sec then we have split that may be too large.
- What was the standard deviation from the mean?
- The deviation from the mean indicates the variability of demand.
- How many cycles was the phase skipped – Split = 0?
- A key parameter. Are we permitting a phase that doesn’t get called?
- How many cycles did the phase max out – Split = Programmed value?
- Is demand such that all the split time is being used and may need increasing?
- How many times did the split exceed Programmed value?
- When did previous unused split time get carried forward?

Continued on page 32

IMSA Journal

Introducing BroadbandPro™ Enterprise.

More information on network performance. Detailed reporting. Multiple email alarm options. These are just some of the advanced features in the all-new BroadbandPro™ Enterprise.

Even better, this ground-breaking software still offers drag-and-drop configuration for easy programming or re-assignment of broadband units. There’s simply no better way to automatically discover, configure and optimize Intuicom wireless broadband networks.

Because there are so many new features to experience, we’re offering a FREE 30-day trial of BroadbandPro Enterprise for a limited time. Call 303-449-4330 or email its@intuicom.com and start enjoying all the helpful, time-saving features of the new BroadbandPro.
My Macro utilizes Microsoft Excel Spreadsheet’s wealth of built-in functions. It loads the Split Report from a Split Report’s Comma Delimited format, discards the information not required; then run the analysis shown in Table 2. Any manufacturers Split Report could be formatted to run in this Macro.

Table 2: Summary Analysis Results

<table>
<thead>
<tr>
<th>Plan #</th>
<th>Start</th>
<th>End</th>
<th>R1</th>
<th>R2</th>
<th>Cycle Lgth</th>
<th># Cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/10/2013</td>
<td>2</td>
<td>6:42:12 AM</td>
<td>9:30:09 AM</td>
<td>140</td>
<td>64</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinated ?</td>
<td>-</td>
<td>Y</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Y</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Programmed Split</td>
<td>0</td>
<td>82</td>
<td>12</td>
<td>46</td>
<td>0</td>
<td>82</td>
<td>8</td>
<td>50</td>
</tr>
<tr>
<td>Mean (50th Percentile)</td>
<td>0</td>
<td>63</td>
<td>12</td>
<td>46</td>
<td>0</td>
<td>63</td>
<td>7</td>
<td>51</td>
</tr>
<tr>
<td>Std Deviation</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Min Split</td>
<td>0</td>
<td>63</td>
<td>6</td>
<td>37</td>
<td>0</td>
<td>63</td>
<td>0</td>
<td>41</td>
</tr>
<tr>
<td>Max Split</td>
<td>0</td>
<td>64</td>
<td>12</td>
<td>52</td>
<td>0</td>
<td>64</td>
<td>8</td>
<td>64</td>
</tr>
<tr>
<td>% Split = 0</td>
<td>100.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>100.0%</td>
<td>0.0%</td>
<td>37.5%</td>
<td>0.0%</td>
</tr>
<tr>
<td>% Split &gt; Prgm’d</td>
<td>100.0%</td>
<td>0.0%</td>
<td>85.9%</td>
<td>76.6%</td>
<td>100.0%</td>
<td>0.0%</td>
<td>45.3%</td>
<td>37.5%</td>
</tr>
<tr>
<td># Split &gt; Prgm’d</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>35</td>
</tr>
</tbody>
</table>

Table 2 shows the analysis on a sample intersection. What did we learn?

The Analysis
- The data collection period was done on June 10, 2013 from 6:42:12 AM to 9:30:09 AM.
- The intersection was running Plan 2 @ 140 sec cycle length. Split values are shown in the “Programmed” row. Zero value indicates the phase was not used.
- In this period, 64 cycles ran. I extracted any Plan transitioning periods and data outliers so as not to skew the data.
- Phase 3
  - Max’d out 86% of the time.
  - Average split was equal to the programmed value – deviation only 1 second.
  - Min Split was half of the programmed value.
  - Phase was never skipped.
  - Conclusion
    - Needs a more detail observation.
    - Probably should be adjusted upward to satisfy demand.
- Phase 4
  - Max’d out 77% of the time.
  - Average split was equal to the programmed value – deviation only 2 seconds.
  - Min Split was more than half of the programmed value.
  - 11 times Phase 3 gapped out and added time to Phase 4.
  - Conclusions
    - Performed adequately.

This data can also be displayed graphically for reports or to build an easily understood composite view.

Thus, we have a performance measurement of the signal timings that can help make adjustments for efficient intersection operation.

The one drawback to this method is the coordinated phase usually does not have detection. Its split time is indirectly controlled by its minimum value and the results of the conflicting phases. This is where a Time-Space Diagram (TSD) tool can help. Speed-Delay run data is used to check how the coordinated movements are performing.

With a little effort, pertinent information is readily available from the controller or system without extensive count collection. Using this approach coupled with field observations can assist in improving traffic signal operations with reduced cost and time – worth considering!

Something to think about!