MEASURING AM AND PM PEAK HOUR BUS IDLING AT A LIGHT RAIL TRANSIT STATION IN CALGARY

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Introduction

There are numerous reasons why all fleet operators should consider adopting an anti-idling policy. One of the more compelling reasons for doing this is the immediacy of benefits that are received by the organization that operates the fleet. Unlike many improvement strategies, having such a program requires little to no upfront investment capital and there are well documented resources available to support management in setting up programs to educate and monitor drivers in anti-idling and other fuel conservation behaviours (ref 1). For this reason, since the 1980's, most fleets seek to reduce vehicle idling to lower fuel expenditures, enhance air quality, reduce GHG emissions and save on vehicle maintenance.

But fleet idling is difficult for any organization to manage. Though a simple concept, complexities in supervision arise from the dispersed work environment of drivers who often find shutting off vehicles inconvenient due to risks of not restarting, feared reduction of cabin comfort and a resistance to supervisory intervention. Managers can also see fleet monitoring as a constraint to hiring qualified drivers.

The author of this paper has been extensively involved in fleet management and best practices benchmarking and implementation in the motor carrier industry of Canada. He has seen firsthand how "what can seem like an obvious good idea" can be difficult to implement as a best practice. At the same time, industry leading trucking enterprises and successful owner operators are making use of these and other approaches and are realizing financial gains as well as

contributing to reduced greenhouse emissions and improved air quality. (refs 2,3)

Across North America, various municipalities have considered and implemented anti-idling policies and bylaws. Some have applied these best practices to the management of their own fleets in order to "lead by example" and realize the direct financial and environmental benefits that accrue. Many of these have included transit fleets. In some instances, municipalities have attracted media attention and interest in anti-idling green initiatives, or lack thereof. (refs 4,5,6,7,8).

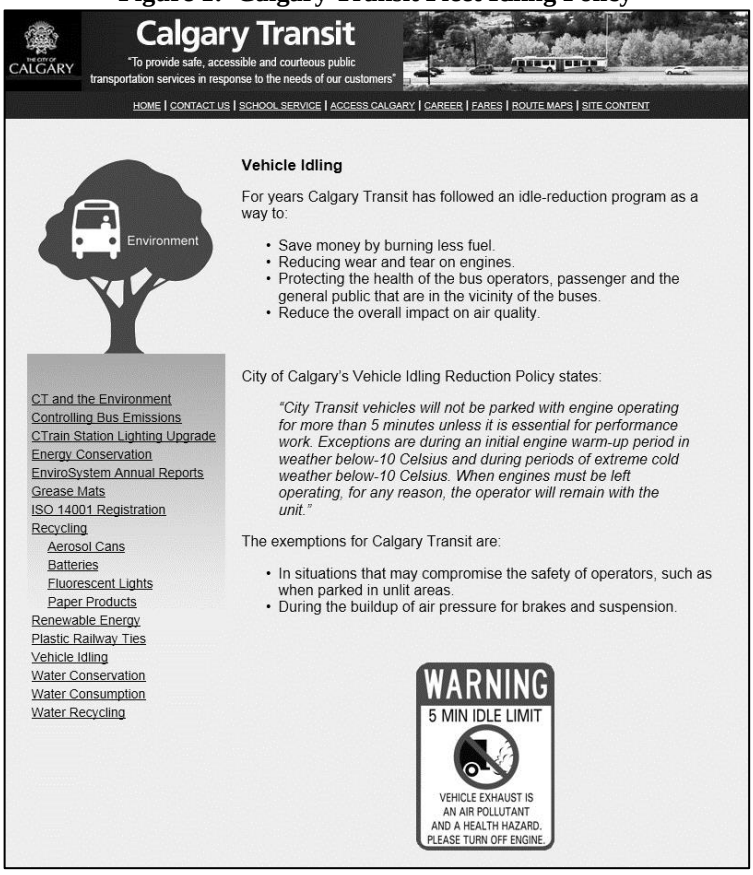
In this context, Calgary Transit publishes a fleet idling policy on their website. (ref 8) Figure 1, following is a screen capture of the policy posted by Calgary Transit.

There is some debate as to what should be the expected idling time threshold to adopt for an anti-idling policy. Some municipalities in Canada have adopted a 3 minute idling threshold for vehicle shut off, for example Edmonton (ref 7) and Halifax (ref 9). We note that Calgary has adopted a less restrictive, 5 minute standard (see Figure 1).

As a regular commuter by transit in Calgary since early 2000, the existence of the cited policy in Figure 1 was surprising. It came to our attention firstly in response to a suggestion and concern we had provided to our local city council representative asking for Calgary Transit to look into energy efficient measures such as anti-idling. In addition to the fact that this observer had never recalled seeing a Calgary transit operator shut the bus down when idling for extended periods, the part of the policy that speaks to "when engines must be left operating, the operator will remain with the unit" appeared to be largely ignored, from our anecdotal recollection. In our experience, drivers frequently leave the bus running while apparently purchasing coffee at a convenience store, or visiting the driver area at the transit station (presumably a bathroom break), or exiting the vehicle to have a smoke break or for fresh air / stretch or other purpose. Clearly,

failure to shut the vehicle down has liability implications and is a risk to public safety.

Figure 1: Calgary Transit Fleet Idling Policy



Source: http://www.calgarytransit.com/environment/idling.html

In order to test the validity of our anecdotal experience, as well as to possibly shed light on the relative differences between how much idling reduction would differ between a 3 minute and a 5 minute idling threshold, we decided to carry out a short observational survey

of bus idling in Calgary Transit operations. The project was originally planned for June 2013, however the mid June flooding occurred and this significantly impacted normal Calgary Transit schedules as special shuttle services were required due to a flooded LRT tunnel, etc. that month. We also wanted to avoid the summer school vacation months of July and August when transit ridership is different and road traffic conditions in Calgary are expected to be lighter than normal.

For this paper, we conducted an observational survey of one sample AM peak period at a single Calgary Light Rail Transit (C-train) station on a Thursday in September 2013 and we also revisited the same station for a sample PM peak period for a Tuesday in September 2013.

It was believed that the choice of a C-train station would be a good place for observing bus idling as Calgary Transit services are frequently convergent at these hubs. These hubs are key timing control points for bus routes so would be places we would expect significant bus idling to occur.

Note that there are other timing control points on longer city bus routes, however these are very dispersed throughout the city and would be costly / difficult to sample. In addition, we were not able to observe the amount of "start of shift idling" that happens at bus garages in the city as vehicles are first warmed up for use each day. Though we have anecdotal information that the city undertakes excessive warm up idling at these locations, they are not in easy to observe public places that would be susceptible to an observational survey without knowledge and assistance from Calgary Transit.

Our selection of the Heritage Station on Calgary's south leg of the C-train was based on our familiarity with the location, it's accessibility to us between our home and work, and the existence of good locations where we could observe bus operations by sitting inside a private auto without attracting attention / altering how drivers might behave if we were noticed.

For each of the two survey periods, we recorded times of bus arrivals and departure on paper, referring to our auto digital clock, as well as the prevailing ambient temperatures observed using our auto thermometer.

We hoped from our survey to objectively measure whether Calgary Transit's idling policy is evident from driver behaviour and to begin to measure the magnitude of bus idling. Although clearly such a small time interval of sampling limits extension of our findings, such a survey might permit us to begin to develop macro estimates of fuel consumed and tonnes of GHG emissions from idling at this station and possibly across the system.

Following Tables 1 and 2 summarize the observational results from our short AM and PM surveys of bus idling.

From Table 1, we note that the median period for AM peak bus idling at this station was 5 minutes and the average was 4.8 minutes from a sample of all 110 buses transiting the station during the sampling period of slightly over 3 hours. Three buses in the sample essentially had no idling, they merely paused to pick up and/or discharge passengers and the maximum idling period observed were from 3 of the units that were seen to be idling (apparently at the start of their shift) between 15 and 18 minutes beside the driver employee area adjacent to the transit station. The total idling that was observed for the 110 bus sample amounted to 527 minutes of transit idling (none of the units was observed to shut off) and from the sampling, it appeared that if the 5 minute threshold published in Figure 1 were followed, this would amount to a reduction of 77 % of the observed peak AM weekday idling. (a saving of 406 minutes of bus idling).

Should the more restrictive 3 minute threshold be implemented, savings would have amounted to 93 % of the observed peak weekday idling. (490 minutes).

Table 1: Summary of Observed Bus Idling AM Peak Hour

Location: Heritage Station, Calgary, AB
Date: Thursday Sep 5 13
Time Sampled: 5:20 AM - 8:37 AM
Ambient Temperature: 13 C° (start) to 16 C°

Idle Time (mins)	No. Obs. (N)	Total Idle Time (mins)	Percent of Obs %
0	3	0	3%
1	11	11	10%
2	13	26	12%
3	16	48	15%
4	9	36	8%
5	22	110	20%
6	14	84	13%
7	5	35	5%
8	6	48	5%
9	3	27	3%
10	4	40	4%
13	1	13	1%
15	1	15	1%
16	1	16	1%
18	1	18	1%
Total	110	527	100%

Average Idle Time (Mins): 4.791
Median Idle Time (Mins): 5.0
Max Idle Time (Mins): 18.0
Min Idle Time (Mins): 0.0
STDEV Idle Time (Mins): 3.214

Percent of Idle Time greater or equal to 5 Mins 77.0%
Percent of Idle Time greater or equal to 3 Mins 93.0%

Table2 : Summary of Observed Bus Idling PM Peak Hour

Location: Heritage Station, Calgary, AB
Date: Tuesday Sept 17, 2013
Time Sampled: 16:32 PM - 18:09 PM
Ambient Temperature: 20 C°

Idle Time (mins)	No. Obs. (N)	Total Idle Time (mins)	Percent of Obs %
0	11	0	15%
1	21	21	29%
2	14	28	19%
3	6	18	8%
4	3	12	4%
5	7	35	10%
6	5	30	7%
7	2	14	3%
8	0	0	0%
9	1	9	1%
10	0	0	0%
11	0	0	0%
12	1	12	1%
13	0	0	0%
14	0	0	0%
15	1	15	1%
Total	72	194	100%

Average Idle Time (Mins):	2.694
Median Idle Time (Mins):	2.0
Max Idle Time (Mins):	15.0
Min Idle Time (Mins):	0.0
STDEV Idle Time (Mins):	2.807

Percent of Idle Time greater or equal to 5 Mins	59.3%
Percent of Idle Time greater or equal to 3 Mins	74.7%

Table 2 showed significantly less bus idling during our peak PM sample period. Note that the sampling time of day and location was likely a factor in this difference as our sampling was late during the peak and many of the buses were almost at the end of their scheduled runs, many having gone through significant PM road congested traffic en route to the station. For this reason, we conclude that perhaps the drivers were arriving at this station with less schedule "leeway" than in the morning peak. In essence, at this station, at this time, the drivers were completing their last runs and were probably closer to or perhaps slightly behind their schedules, hence would be spending less time at the time control point than for the sample that

was earlier in the day when drivers were first setting out on their runs according to the schedule.

In this sample, the median and average idle time observed for 72 observations were 2 minutes and 2.7 minutes respectively. Even for this sample, the total idling amounted to 194 minutes and it would appear that Calgary transit's 5 minute threshold policy would have reduced the idling by 60%. The more restrictive 3 minute threshold noted for other jurisdictions would have eliminated 74% of the idling minutes.

Liability Concern

During our observations, three of the morning peak idles were left unattended, with durations of 4 minutes, 16 minutes and 18 minutes respectively. In the afternoon observation periods, there were three similar idles of duration 6 minutes, 7 minutes and 9 minutes as well as one operator who took a 7 minute smoke break in visual sight of the vehicle but distant from it.

Conclusions

Though Calgary transit went to the effort to enunciate and publish an anti-idling policy, the observed behaviour of drivers indicates that it is largely not being followed.

Significant gains are possible just from following the Calgary transit policy of anti-idle shut down for periods exceeding 5 minutes (77 % of all idling would be eliminated in our AM sample and 59 % of idling in our PM sample which was probably not collecting data at the correct "timing control points" for the PM peak hour)

If a three minute threshold rather than a five minute threshold were adopted, the saved idling increases to 93% of AM idling time and 75% of the observed PM idling time at this station.

Given the sampling size involved in this study, it is difficult to extrapolate reduced idling and emissions savings to an annual or city-wide total, however other jurisdictions in Canada are reporting significant fuel, maintenance and GHG reductions from anti-idling.

End Notes:

1. Natural Resources Canada, Office of Energy Efficiency, web link at http://oee.nrcan.gc.ca/home , browsed October 3, 2012
2. Brendan O'Beirne and Lloyd Ash, Mount Royal University, "METHODS FOR REDUCING CARBON OUTPUT IN THE TRUCKING INDUSTRY", presented at CTRF 2012, Calgary, Alberta
3. Gurpreet Gill, Jesse Merriam, Kalinga Jagoda, Mount Royal University, "INTEGRATION OF GREEN INITIATIVES IN THE TRUCKING INDUSTRY: AN EVOLUTIONARY PERSPECTIVE", presented at CTRF 2011, Gatineau, Quebec
4. TRANSPORTATION RESEARCH BOARD, "On Mitigating Excessive Idling of Transit Buses", web link at http://pubsindex.trb.org/view.aspx?id=911415, browsed Oct 2012
5. Oakville Ontario, " The Idling of Transit Buses", website at http://www.oakvilletransit.com/788.htm, browsed Oct 2012
6. "Why are Winnipeg Transit buses idling in the summer for up to 40 minutes?", CBC Winnipeg, Aug 2012, web link at http://www.cbc.ca/news/canada/manitoba/story/2012/08/14/mb-transit-buses-idling-winnipeg.html, browsed Oct 2012.
7. Edmonton Transit System, Limited Idle Program, web link at http://www.edmonton.ca:8084/transportation/ets/about_ets/ets-limited-idling-program.aspx, browsed Oct 2012
8. Calgary Transit, web link at http://www.calgarytransit.com/environment/idling.html, browsed Oct 2012
9. "Idling Gets You Nowhere" , Produced by the Office of Energy Efficiency FleetSmart Program, Natural Resources Canada, web link at http://fleetsmart.nrcan.gc.ca/index.cfm?fuseaction=docs.view&id=1#idling, browsed Oct 2012.