

Methane Slip in Natural Gas Fired Stationary Engines Report Revision

Contract Number 24-ARPC-01

Accurata Inc

Project Summary for Months 08 and 09 of Year 2024 (Report #1)

Funds awarded: \$94,334

Funds invoiced to date: \$73,968.75

Remaining project Funds: \$20,365.25

Technical Champion: Sean Hiebert

Revise the previously prepared Methane Slip Report to accommodate changes requested to offer more clarity for specified aspects of the report. The current ECCC limits at 1 g/kW-h would see over 70% of our engine fleet in excess of this limit. The industry has invested years and millions promoting changes in operating and technology changes to reduce engine NOx emissions while simultaneously reducing fuel consumption. The technology for NOx reduction with lean burn combustion technology does not meet the regulatory methane slip proposed limit. An alternate approach is required to maintain the integrity of our natural gas infrastructure. This report revision offers more detail to aspects that may not presently be considered.

Total Project: Milestones and budget

Milestone	Monthly Budgets	Monthly Invoice (e.g., Q2 2021/22)
1 Drafts of items 2 – 8, 11, 12, 13, 14 (best efforts)	\$64,372.80 less 10% [=\$57,934.62]	Q4 2024 (August and September)
2 Drafts of items 4, 8, 11, 12, 14, 16, and incorporate drafts into report, finalize executive summary, manage editorial changes	\$29,962.20 less 10% [=\$26,965.98]	Q4 2024 (October)
10% holdback on final report submission	\$9,433.40	Q4 2024 (November)
Total	\$94,334	

Progress report

Methane Slip Report Requested Additional Scope	Scope change	Cost for current budget at \$100,000	Sept 2024 billing progress	Sept 2024 billing budget
1. Executive Summary: highlight some topics.	included in item 10	included in item 10	0%	\$0
2. Discuss Miller cycle: validate Miller cycle with respect to other technologies.	included in item 15	included in item 15	100%	\$0
3. CO vs Methane Slip: add graphs and discussions.	No change	\$4,217	100%	\$4,217
4. Crankcase Emissions: OEM and other study values along with cost benefit of solutions.	No change	\$18,060	80%	\$14,448
5. Engine Emission Factors: specify four combustion style emissions factors and add multiple units for methane slip emissions factors.	No change	\$12,040	100%	\$12,040
6. Emission factors applied to the MSAPR fleet list: predict methane slip volume from the MSAPR fleet list.	No change	\$3,311	100%	\$3,311
7. Valve Overlap: Detailed discussion of mechanical and operating aspects with OEM data.	No change	\$4,214	100%	\$4,214
8. Fuel gas metering: cost/benefit with detailed discussion and alternatives. Smaller section to be included.	Defer life cycle cost, predictive maintenance analysis for cost benefit analysis.	\$15,468	90%	\$13,921
9. White Superior; own section and sensitivity analysis on group statistics.	Defer	\$0	30%	\$0
10. BMP's: Rework to present as suggested and make technology agnostic.	Not tech agnostic for REMVue	\$23,780	0%	\$0
11. Reading list of published articles: qualify use of Derek Johnson data.	Qualify Derek Johnson analysis alone. No gap analysis or literature study or areas of additional study.	\$0	95%	\$0
12. OEM Published Methane Emissions in Engine Exhaust: Restructure tables, qualify operating aspects.		included in 5 and 15	90%	\$0
13. Test Procedure: technology agnostic, expand lower left segment of graph in Figure 47.	Expand lower left corner of graph. No technology agnostic changes.	\$3,010	100%	\$3,010
14. Graphs Describing Relationship Between Methane Slip and Selected Variables: More discussion on engine methane emissions with tables showing more and less than 1 g/kW	No change	\$10,234	90%	\$9,211
15. The Trade-off between NOx and CH4 Exhaust Emissions: add volume units, elaborate on trade-off.	Defer	\$0	0%	\$0
16. Technology Solutions for Methane Slip Reduction: technology agnostic.		included in 18	50%	\$0
17. Figure 20: Discuss misfires and preventive or corrective measures.	Defer	\$0	0%	\$0
18. General Comments: Change text to be technology agnostic.	Decline	\$0	0%	\$0
19. Editorial: Change title locations on graphs and figures.	By others		0%	\$0
20. Accessible text: rewrite technical content using accessible text.	Defer + \$15,000 by others		0%	\$0
Totals		\$94,334		\$64,371.80

Exceptions Reporting for this Month:

- a) The first billing period includes the last two weeks of August and all of September.
- b) Actual progress is reflected in the listed budget estimates.
- c) Some of the White Superior data contained in item 9 is provided in a new appendix that contains descriptions of engine models and their operating characteristics.
- d) Draft reports are assembled and distributed for information. Those draft reports will be inserted into the existing report and finalized as a revised report.
- e) The overage of about \$10,000 above the specified progress is the result of hour allocations used to complete the various tasks. The remaining budget is sufficient to complete the work.