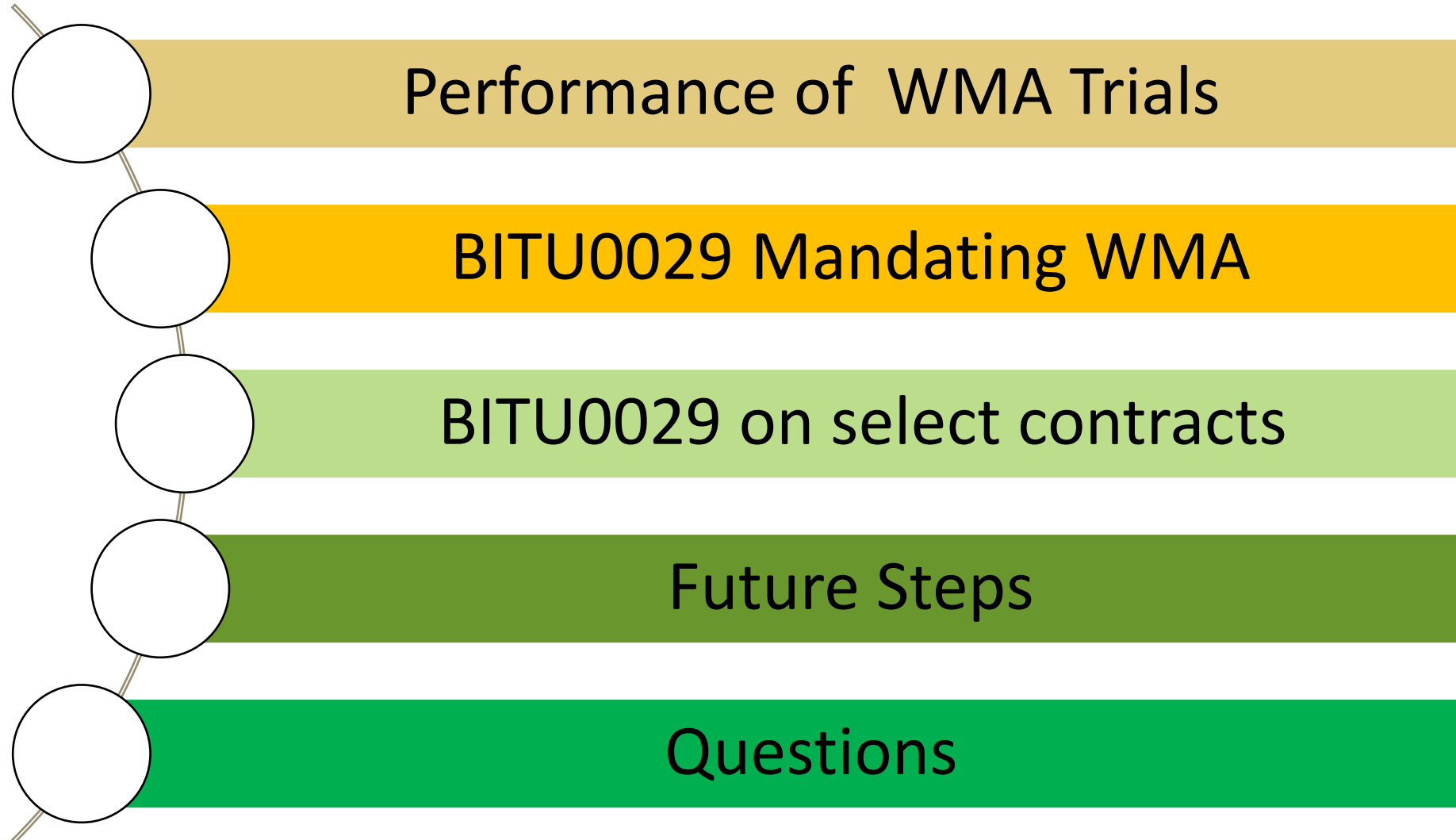


Reducing GHG with Warm Mix Asphalt (WMA)

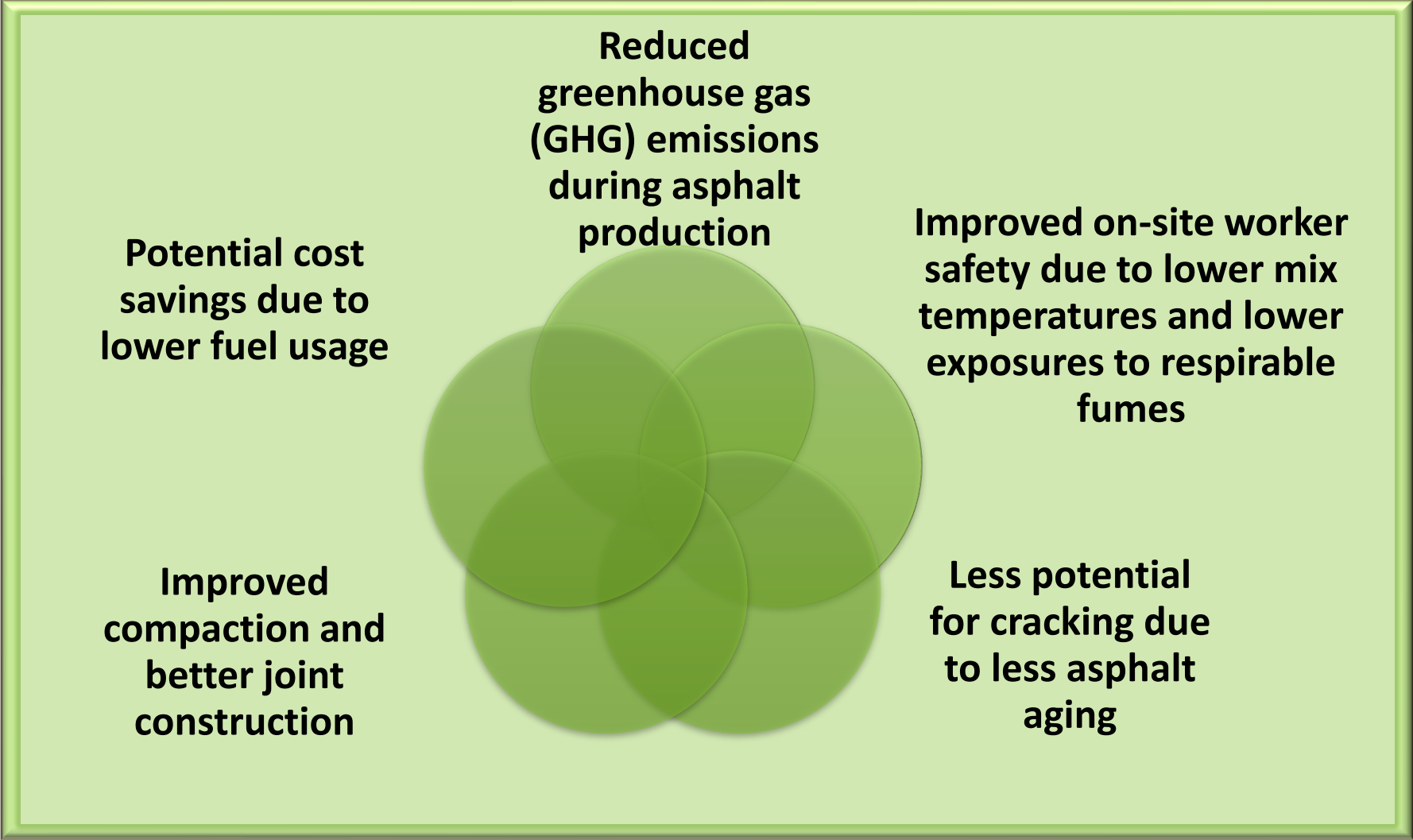
Gelu Vasiliu, P.Eng.
Head, Bituminous Section
Engineering Materials Office

2024 OAPC Fall Asphalt Seminar

Outline



Benefits of Using Warm Mix Asphalt (WMA)

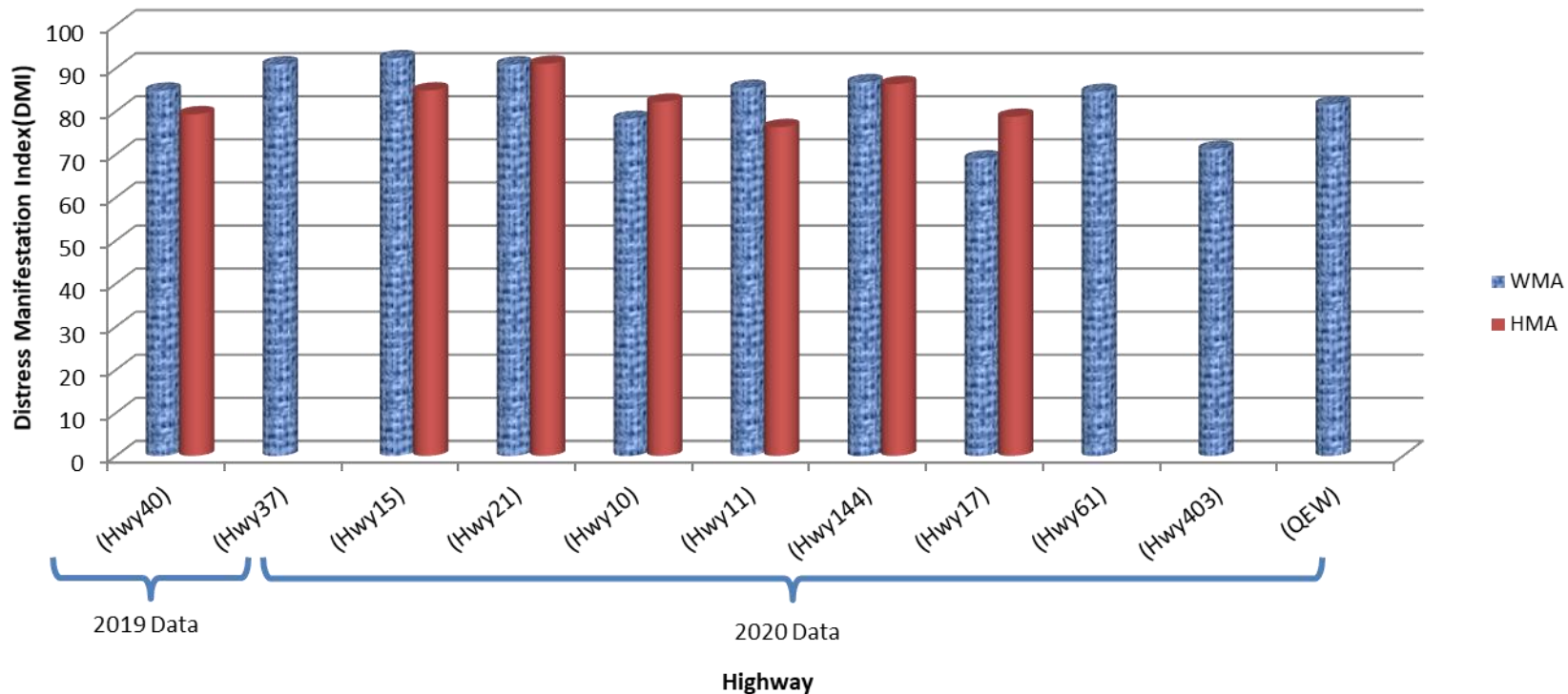


MTO WMA Contracts- Pavement Performance Review

9-10 year performance of WMA test sections were compared with the control HMA sections using ARAN iVision data

Overall, WMA and HMA sections are performing equally

WMA sections are performing better in terms of centreline joint quality



NSSP BITU0029 (amends OPSS 313)

Lists allowable WMA technologies

Includes an HMA control section to compare the pavement performance and GHG emissions with WMA section

Temperature measurements at the plant and paving site for both WMA and HMA

Designer option to measure emissions at the stack of the asphalt plant to confirm reductions in GHG emissions

Additional samples of loose asphalt mix and pavement cores for mix performance testing and moisture sensitivity

Designer option to measure asphalt fume emissions at the paving site

Maximum production temperature :
135 °C, or at least 20 °C lower than HMA and not exceeding 150 °C
Temporary deviations are allowed during daily start-up

When the maximum allowable production temperature is exceeded, the WMA is non-conforming

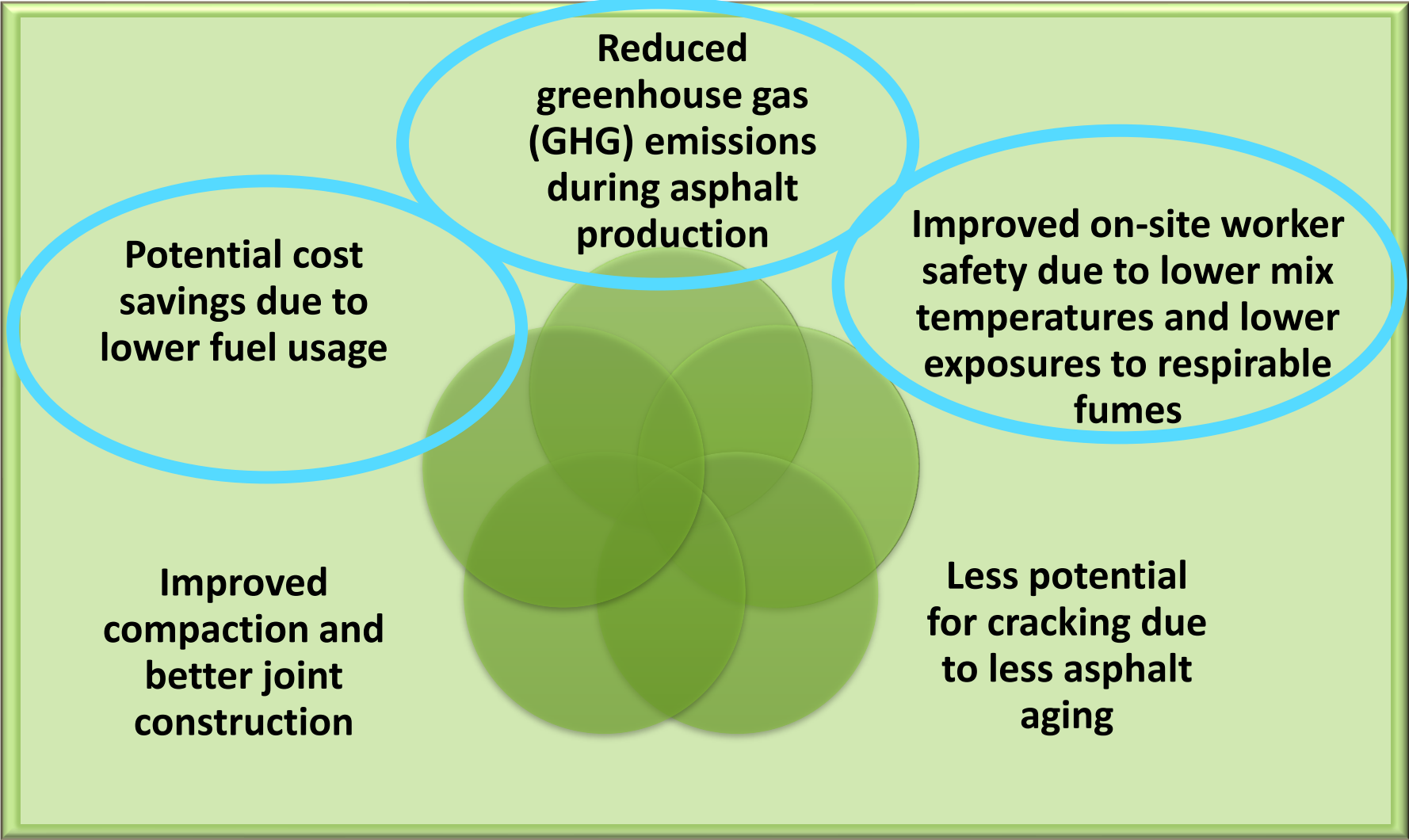
Non-conforming WMA is still accepted into the work subject to payment adjustment

BITU0029 on select contracts mandating WMA

BITU0029 on select contracts mandating WMA

Contract	Region	Months of paving	Asphalt Plant Type	Maximum Production Rate (tonnes/hr)	Fuel Type
A	West	August-September	Drum Plant	200	Natural Gas
B	West	August	Batch Plant	180	Natural Gas
C	East	October-November	Batch Plant	250	Natural Gas
D	East	May-November	Portable Counterflow	350	Natural Gas
E	Northwest	July-August	Portable	300	Natural Gas
F	Central	June-August	Portable Counterflow	270	Natural Gas
G	East	August-October	Drum Plant	400	Propane

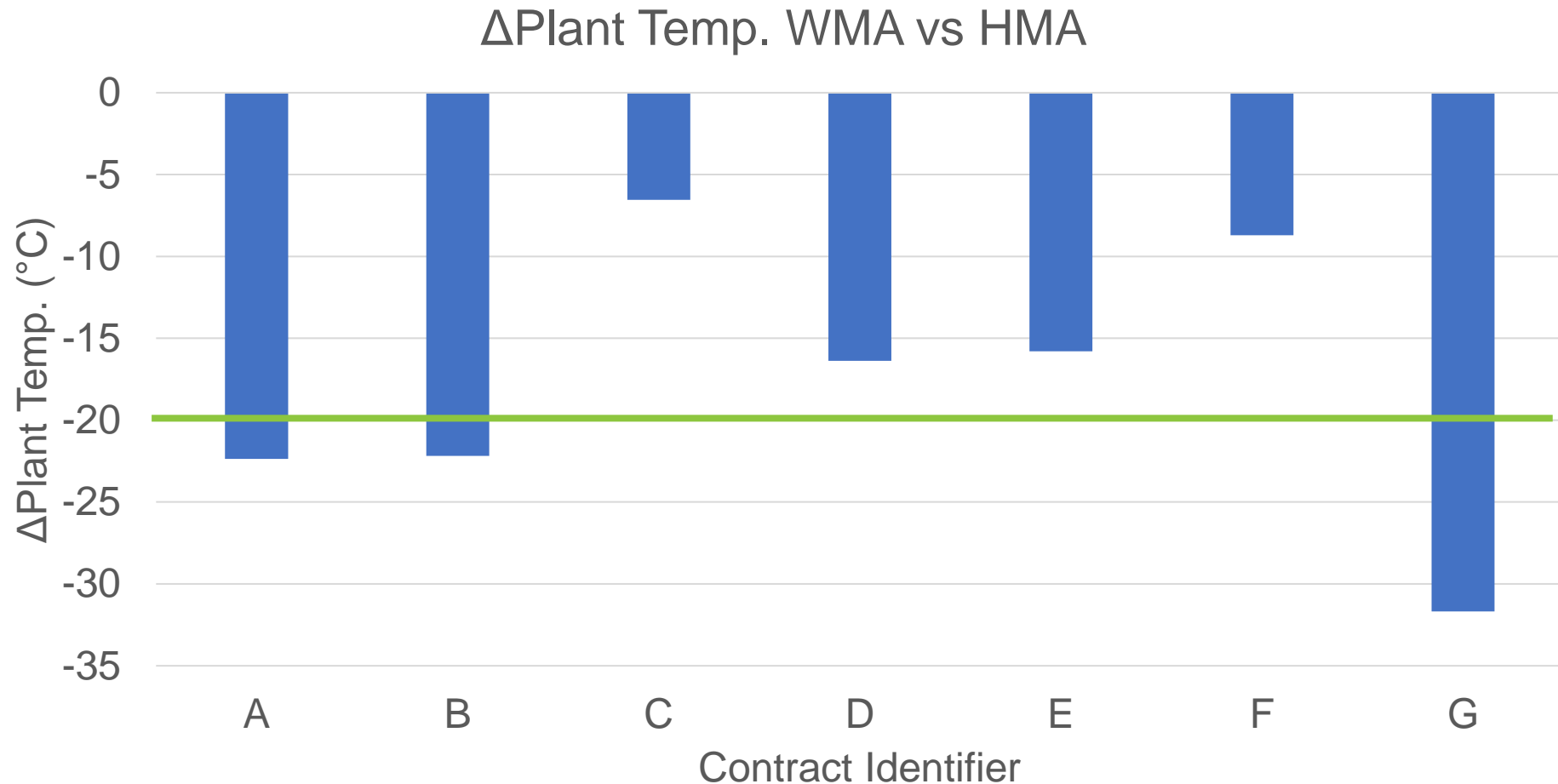
Benefits of Using Warm Mix Asphalt (WMA)



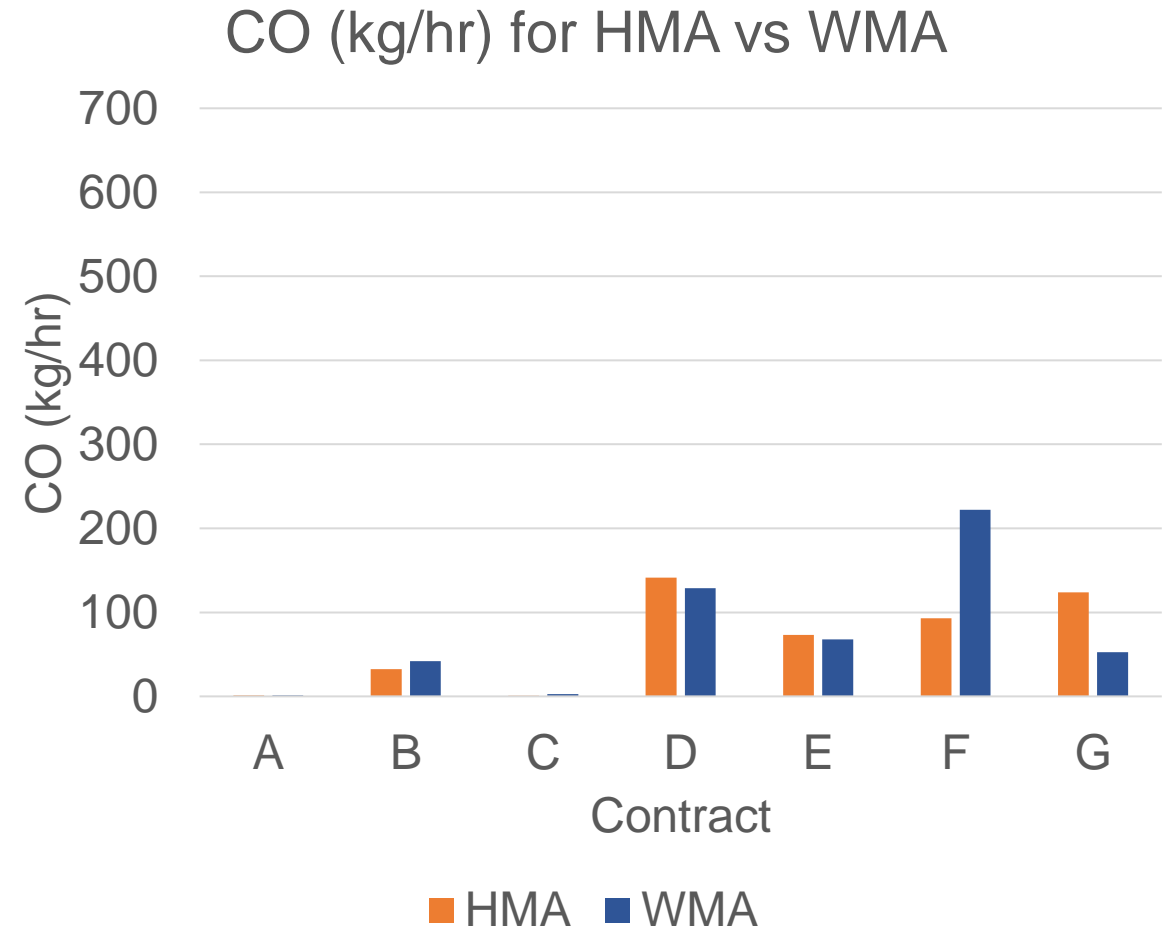
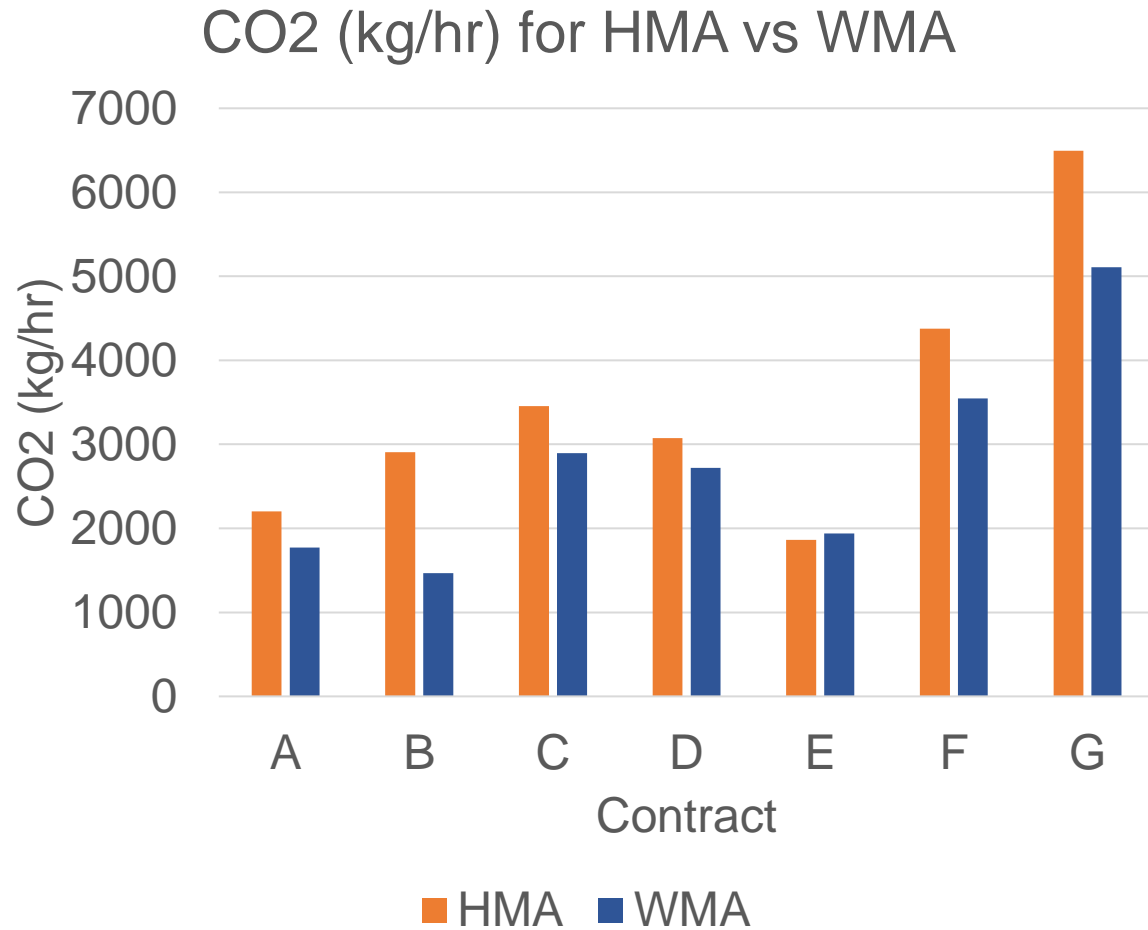
Greenhouse Gas (GHG) Emissions During Asphalt Production

Plant Emissions - Plant Mix Temperature

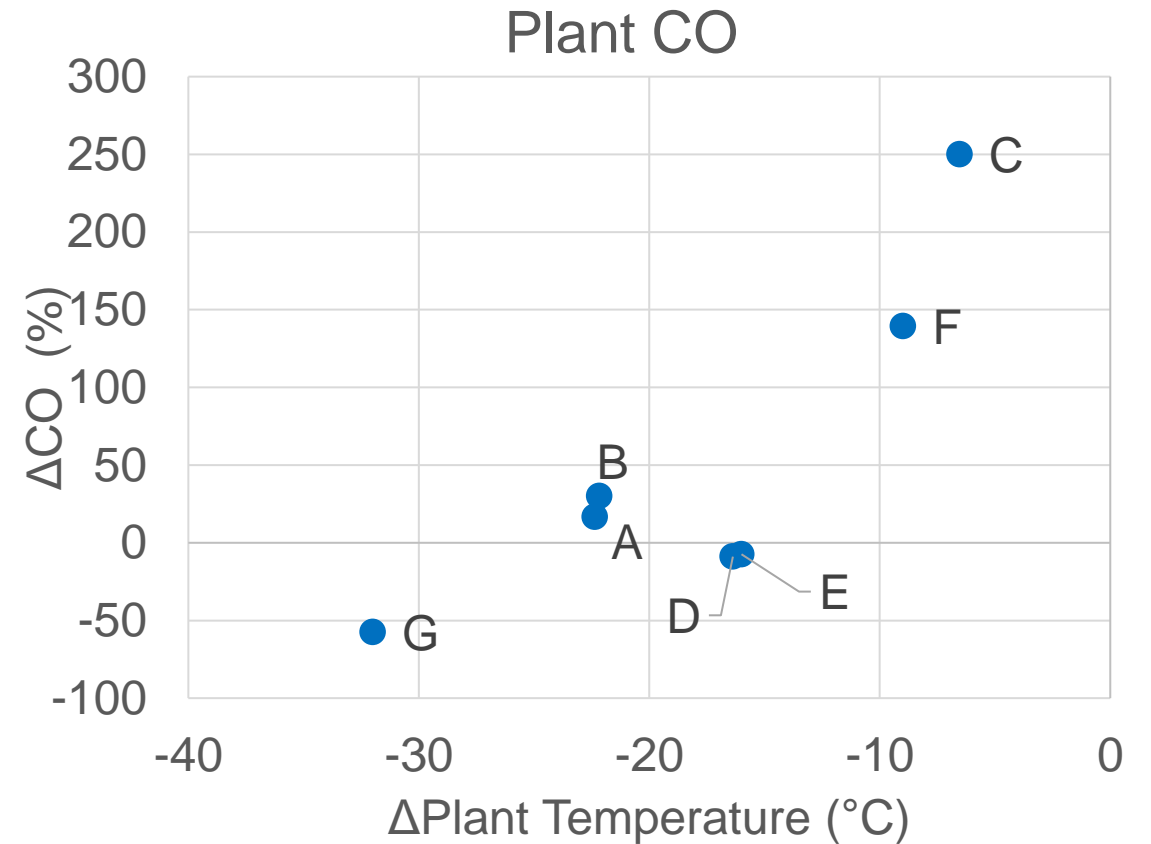
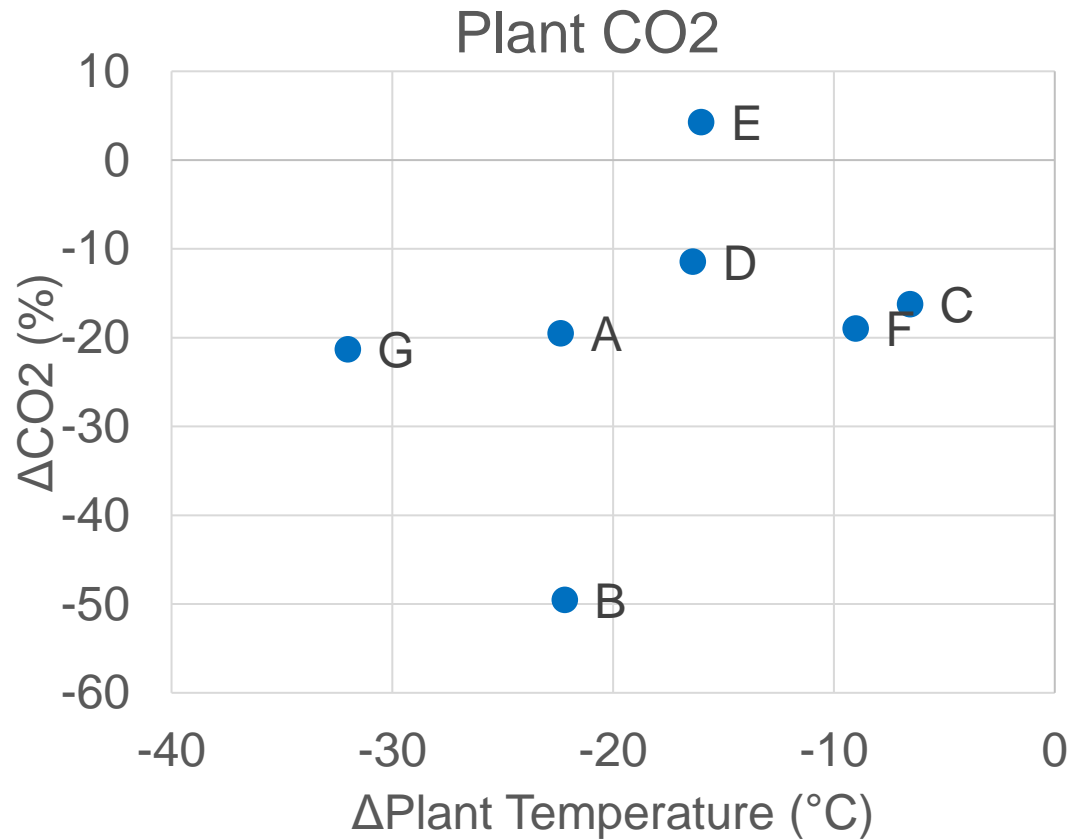
Warm Mix Asphalt means warm mix, warm laid asphalt concrete produced using technologies that allow for the **mixing**, handling, and compaction of the asphaltic concrete mixture at a temperature **20 to 50 °C lower than conventional HMA.**



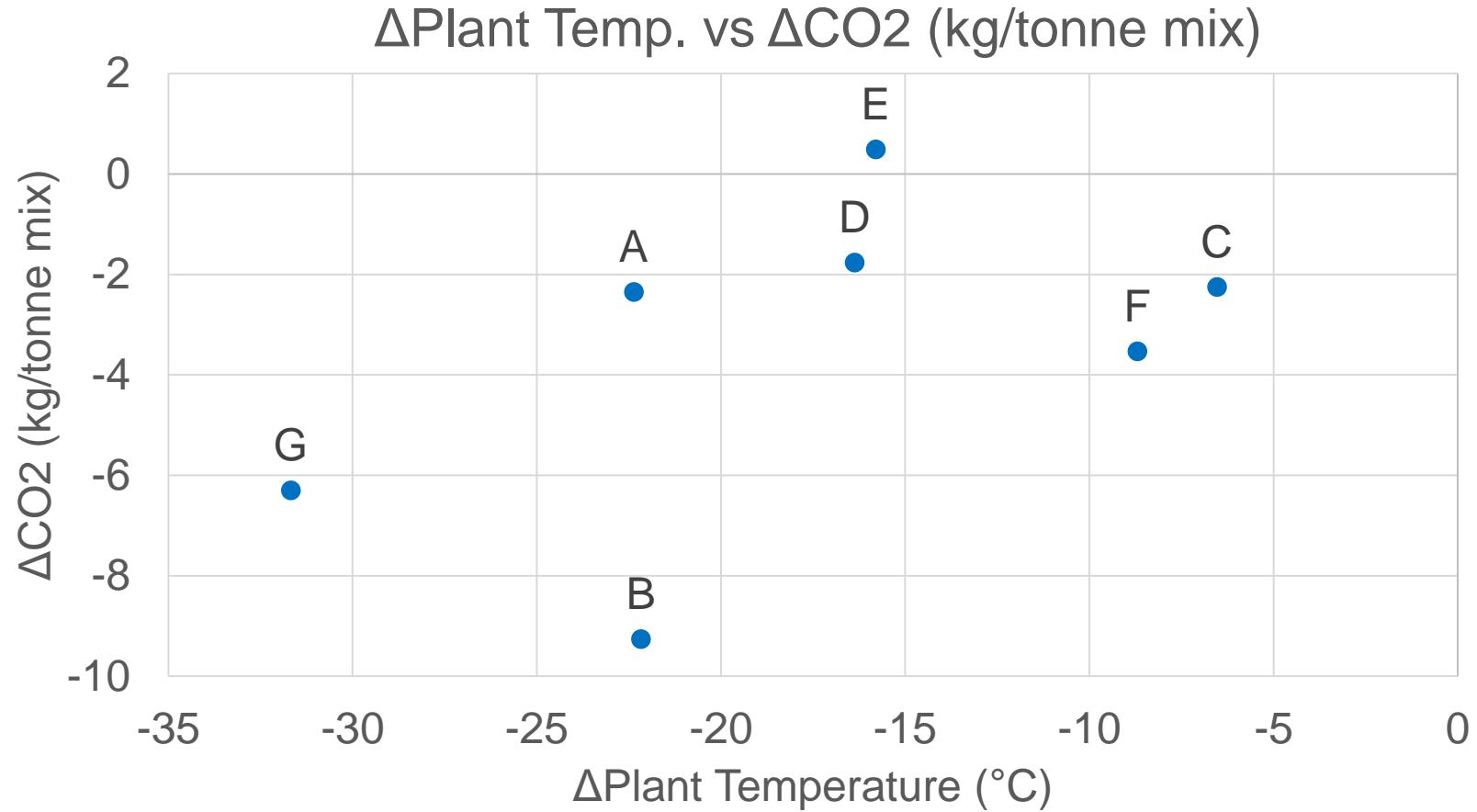
Plant Emissions – Carbon Monoxide and Carbon Dioxide



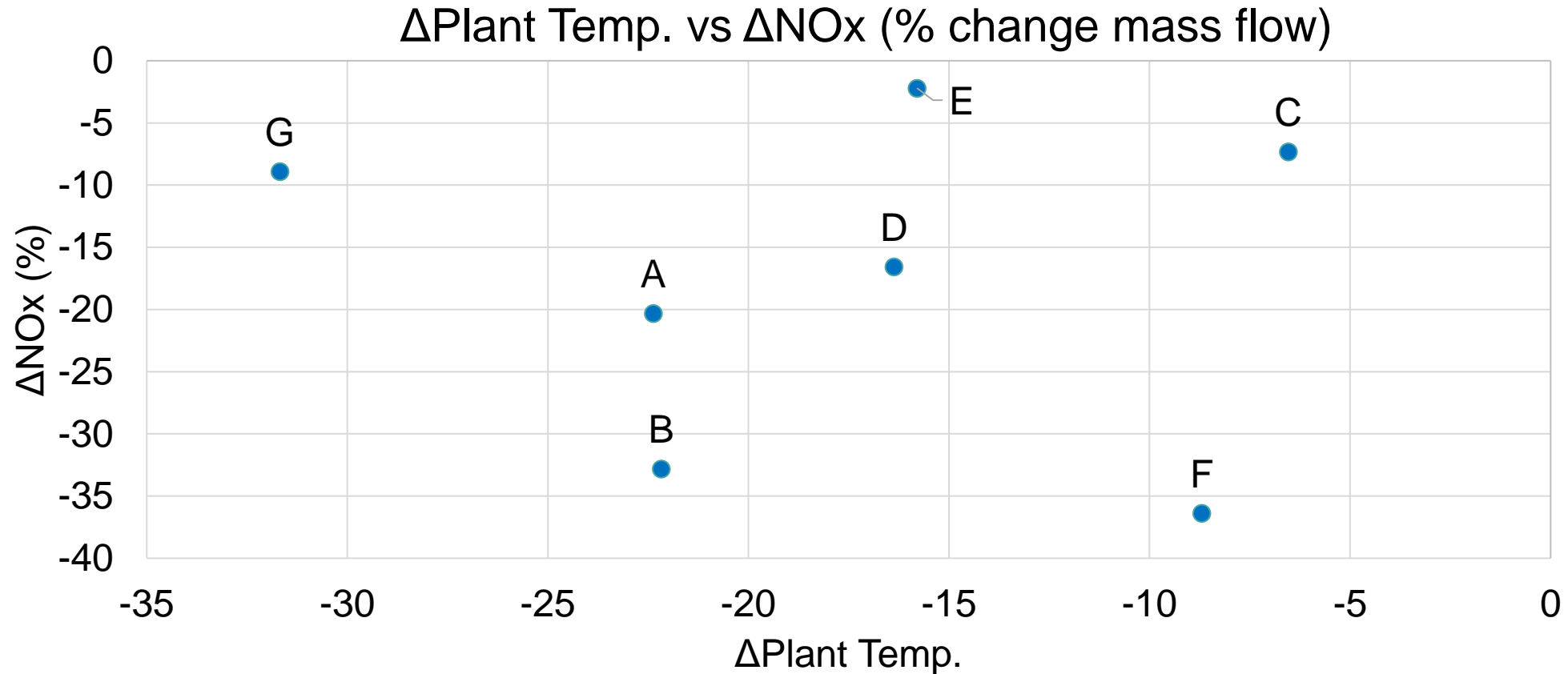
Plant Emissions– Carbon Dioxide and Carbon Monoxide



Plant Emissions – Carbon Dioxide

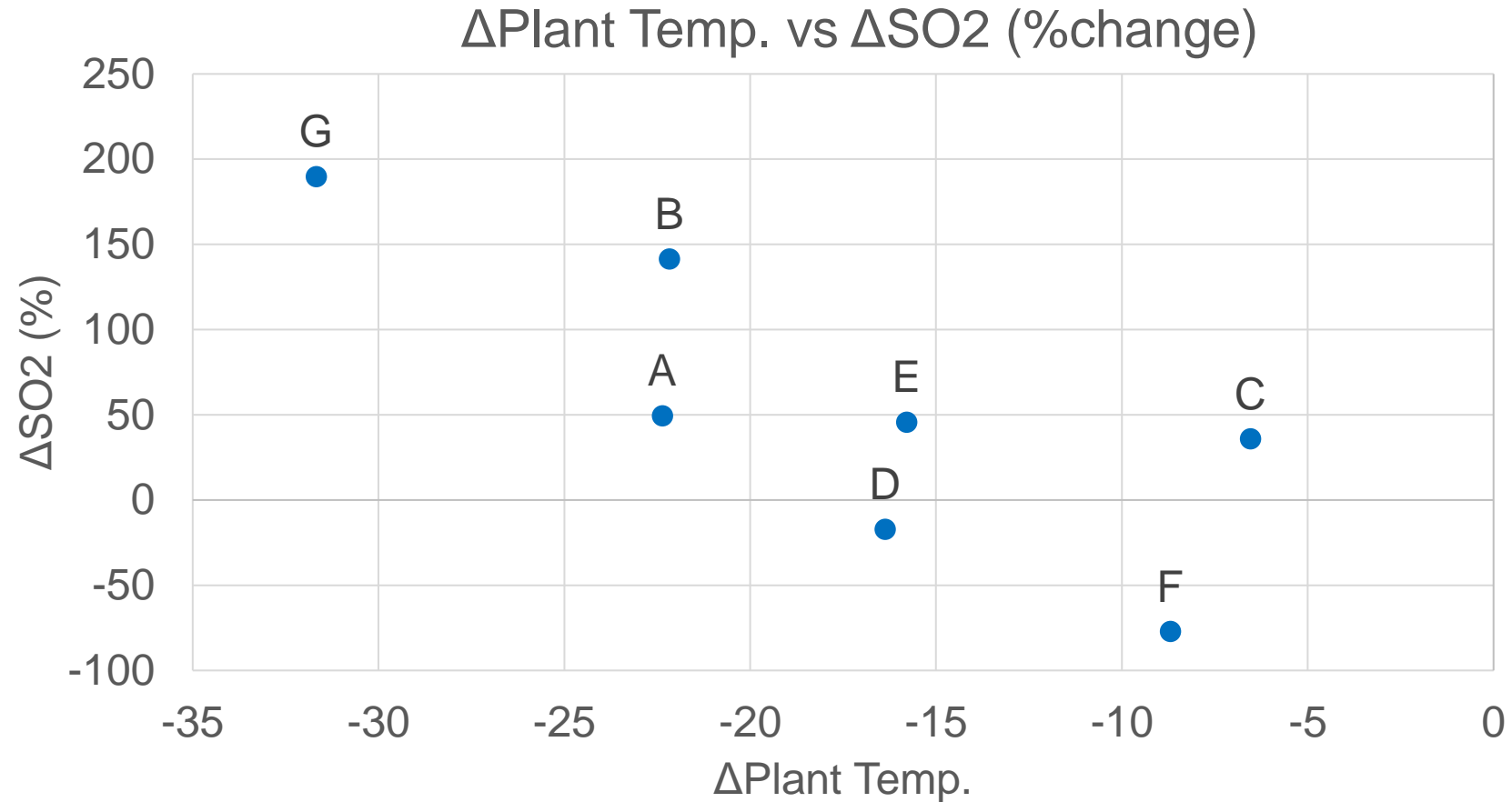


Plant Emissions – Nitrogen Oxides



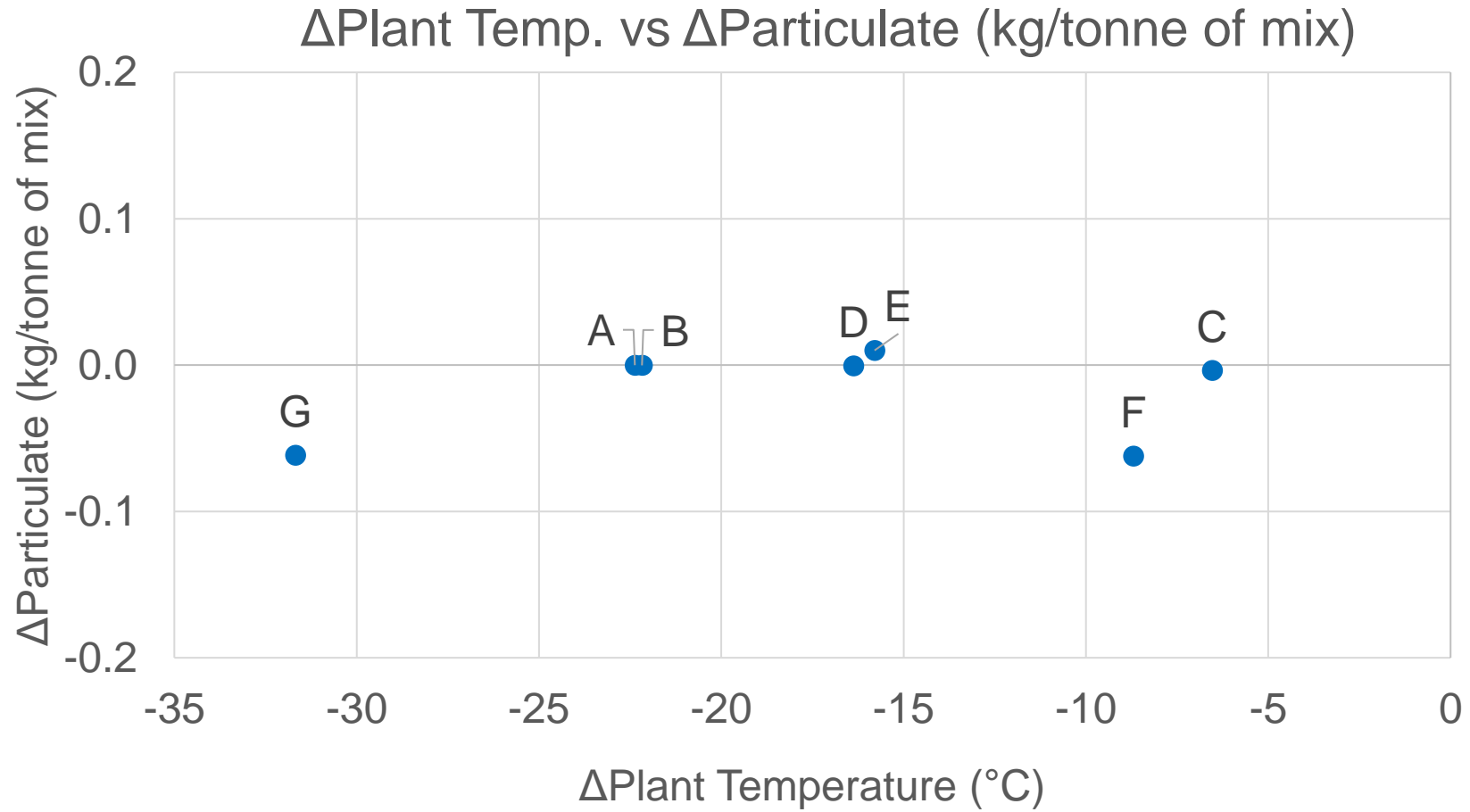
Typical measurements are approximately 10 g of NO_x per tonne of mix.

Plant Emissions – Sulfur Dioxide



Typical measurements are approximately 5 g of SO₂ per tonne of mix.

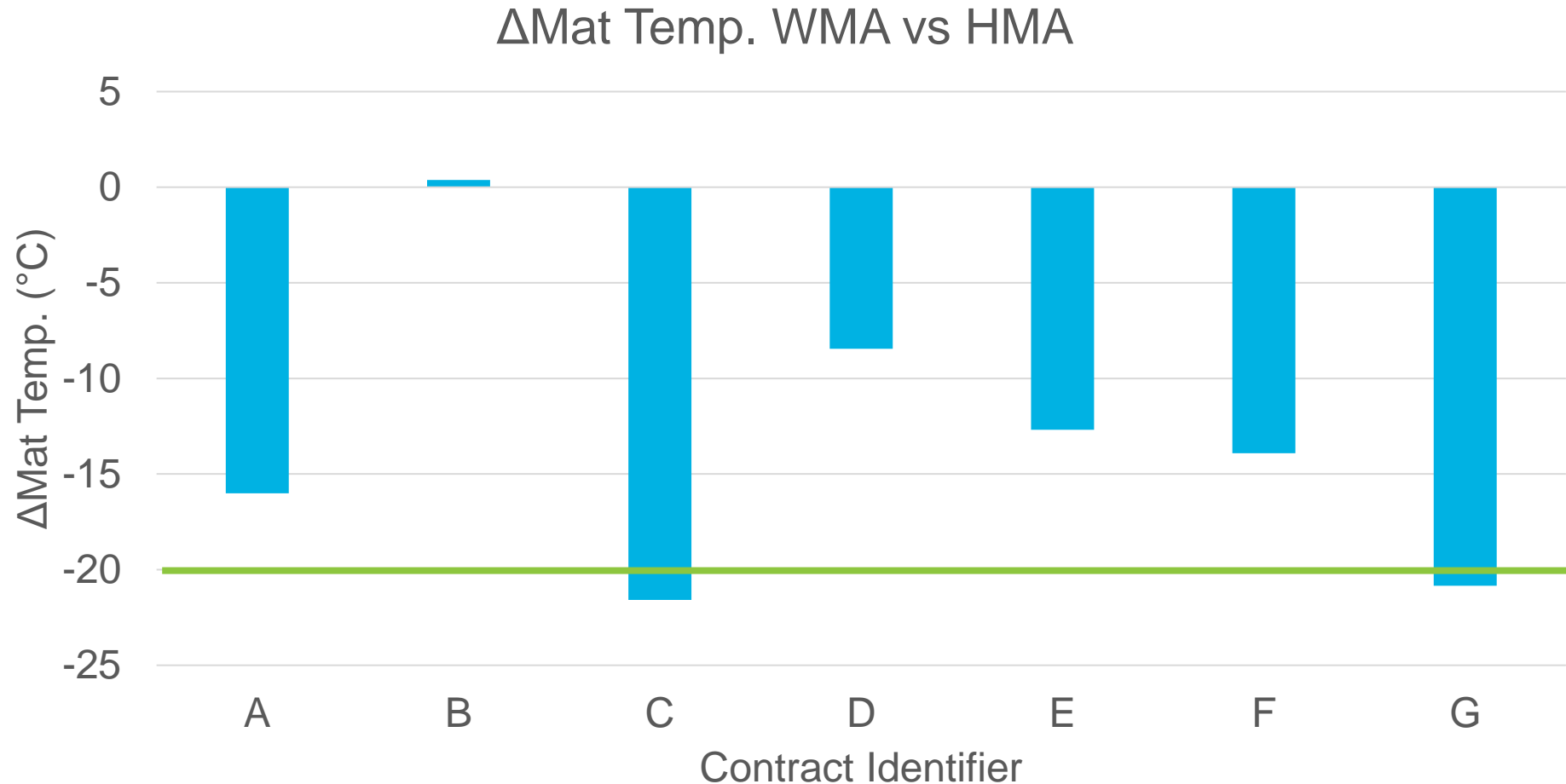
Plant Emissions – Total particulate



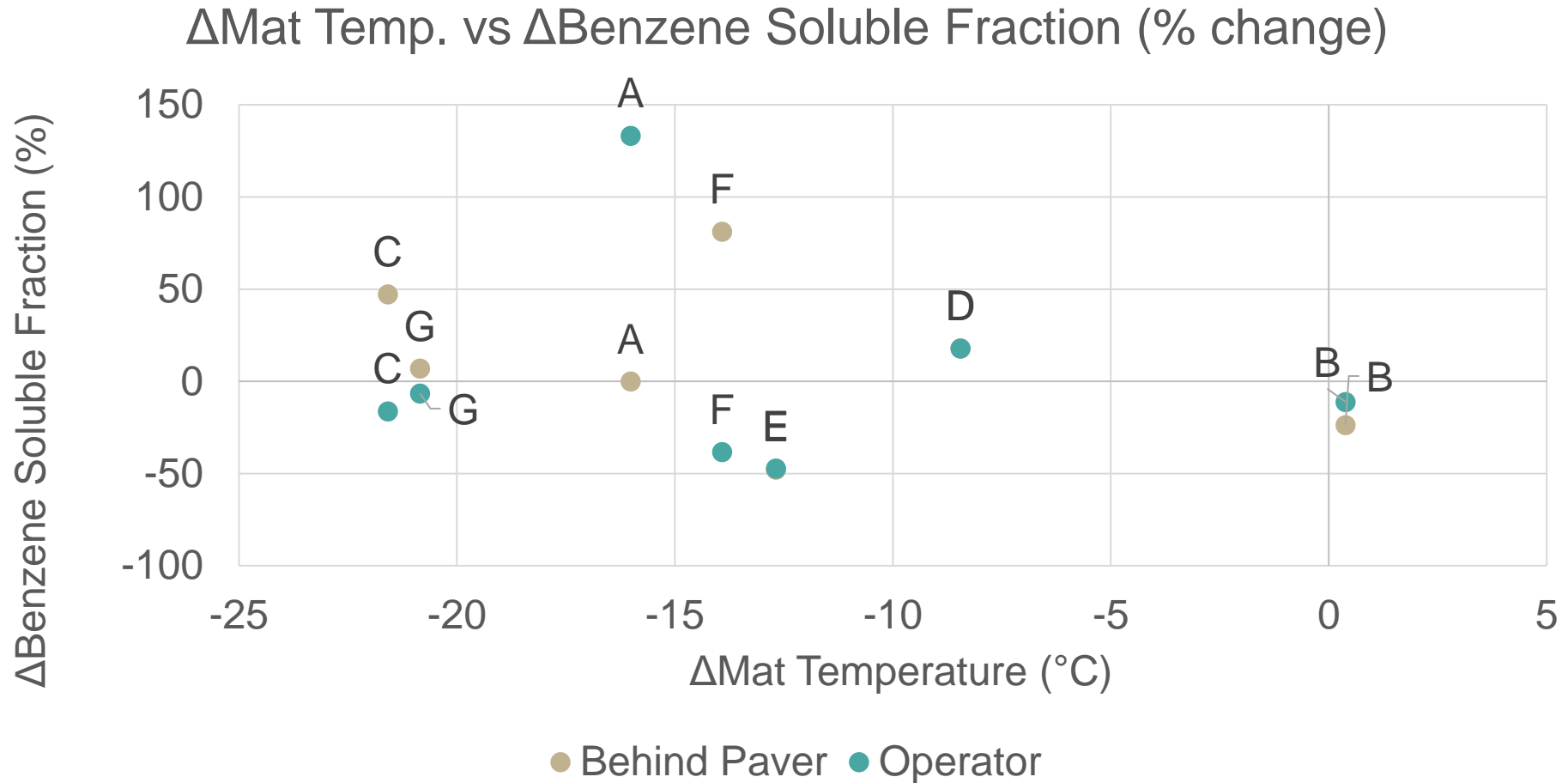
On-site Measurements

On-site Measurements - Change in Mat Temperature

Warm Mix Asphalt means warm mix, warm laid asphalt concrete produced using technologies that allow for the **mixing**, **handling**, and **compaction** of the asphaltic concrete mixture at a temperature **20 to 50 °C lower than conventional HMA**.

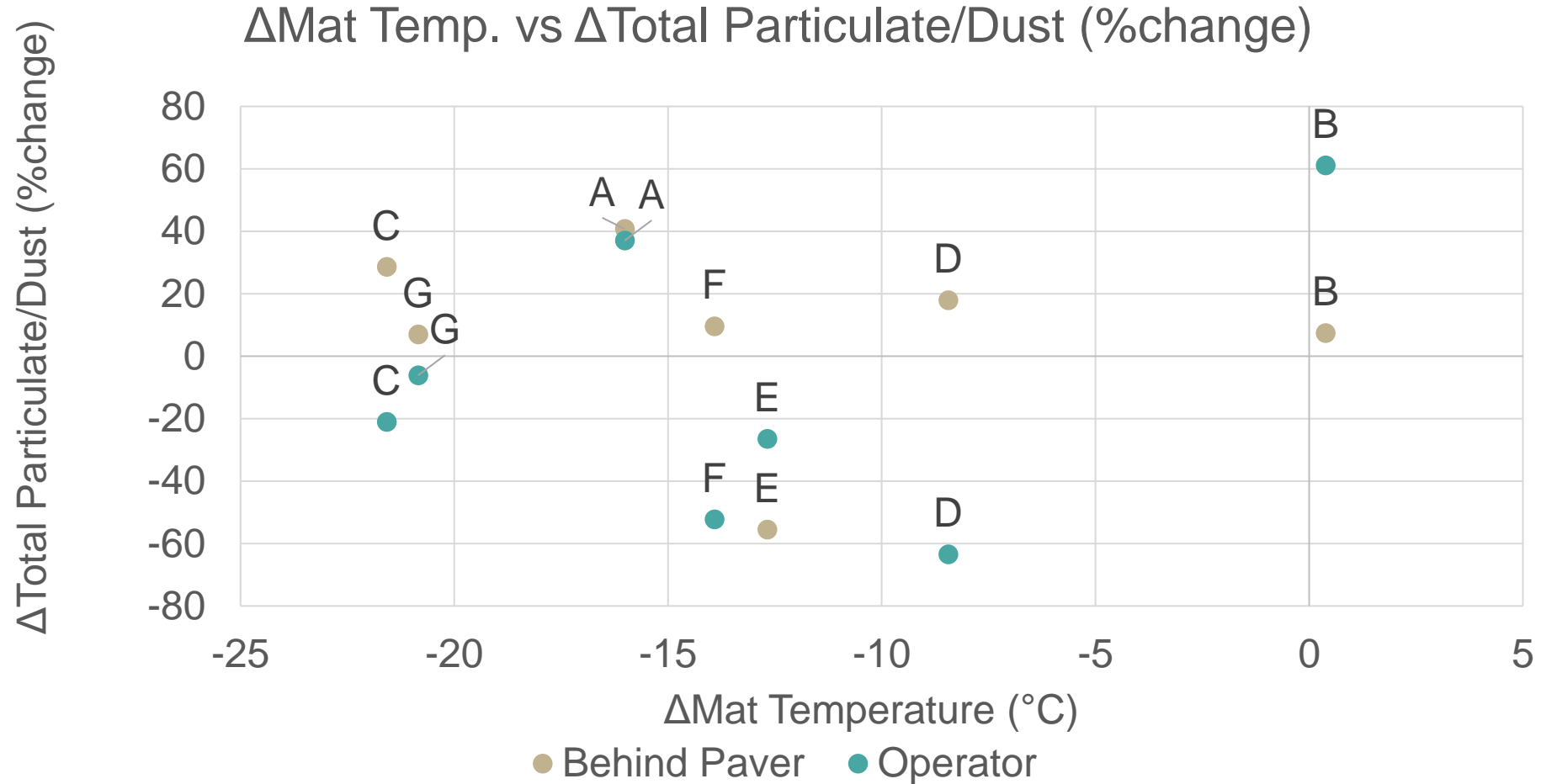


On-site Measurements – Benzene Soluble Fraction



All measurements were $<0.6 \text{ mg/m}^3$
Under the legislated limit of 10 mg/m^3

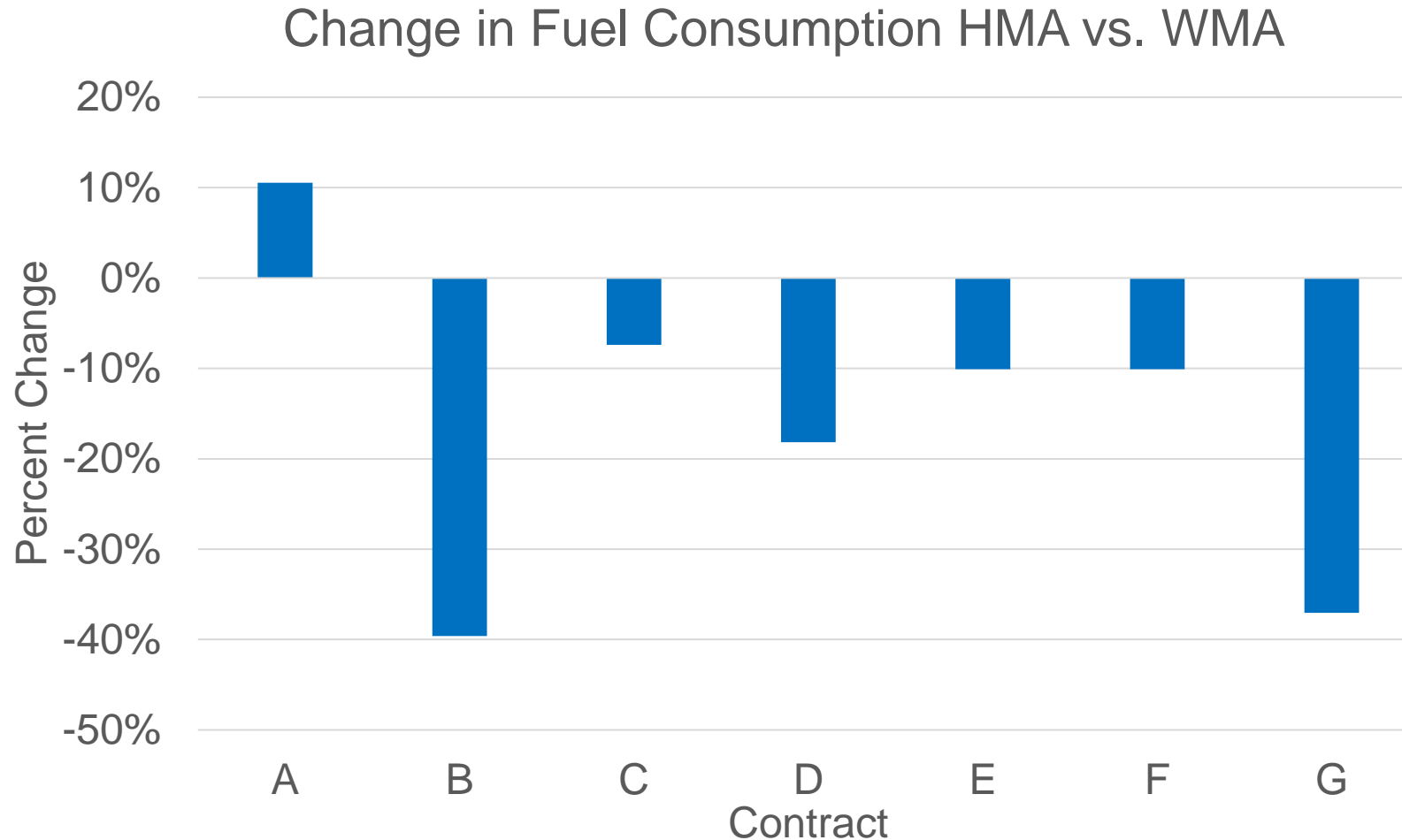
On-site Measurements – Particulate



All measurements were $<0.7 \text{ mg/m}^3$
Under the legislated limit of 10 mg/m^3

Plant Fuel Usage

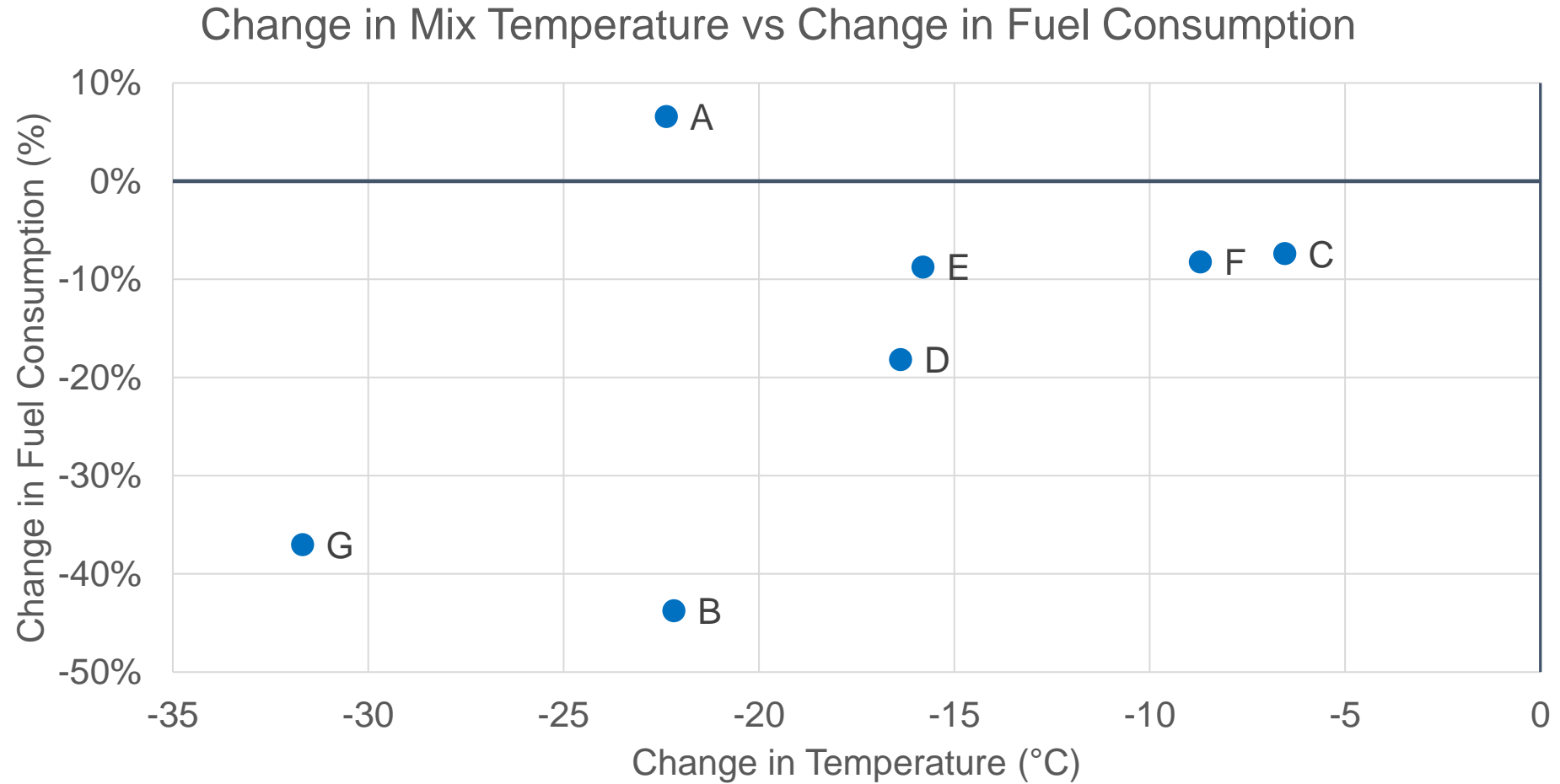
Fuel Consumption – HMA vs. WMA



Percent change based on cubic meters of natural gas per tonne of mix.

Note: G uses propane.

Fuel Consumption – HMA vs. WMA



Next Steps

Next Steps -Future Work

Collect and analyze data from approximately 8 additional contracts

Educate field staff in collection of temperature data

Work with emissions consultants to provide standardized reports

Future Updates to Specifications-BITU0029

Temperature reporting
format and frequency

Clarify requirements
and format for
emissions reports

Eliminate field
emissions
measurements

Integrate Warm Mix
Asphalt verbiage from
OPSS 313

Future Updates to Specifications-Updates to OPSS 313

Transfer all Warm Mix Asphalt verbiage to BITU0029

Refine WMA additive definition to clearly differentiate the use for GHGs reduction(true WMA) and other applications (compaction aid , long-haul additive, etc.)

Questions

Which one is Warm Mix Asphalt?

A)



Aggregate



Asphalt Cement



160°C

B)



Aggregate



Asphalt Cement + Warm Mix Additive



160°C



C)



Aggregate



Asphalt Cement + Warm Mix Additive



130°C

Questions?

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