

Ford 6.7L Valvetrain Wear Precision Matrix Design Options

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Precision Matrix Design Options

The design options have the following considerations:

- 2 Reference Oils (1 HWO and 1 LWO)
- 2 Labs
- 2-3 Total Stands
- 12-15 Tests
- Each stand will begin PM testing with a brand new engine.

Design Options

The 3 test matrix design options are shown below.

Matrix #1

Stand A-1	Stand B-1
HWO	LWO
LWO	HWO
LWO	HWO
HWO	LWO
HWO	LWO
LWO	HWO

Matrix #2

Stand A-1	Stand A-2	Stand B-1
HWO	LWO	LWO
LWO	HWO	HWO
LWO	LWO	HWO
HWO	HWO	LWO

Matrix #3

Stand A-1	Stand A-2	Stand B-1
LWO	HWO	HWO
HWO	LWO	LWO
HWO	HWO	LWO
LWO	LWO	HWO
LWO	HWO	HWO

Design Evaluation Metrics

Some design evaluation metrics are compared in the table below.

Rank	Repeatability Estimate	Reproducibility Estimate	Statistical Power for Oil Discrimination	Cost
Best	Matrix #3 (11 df)	Matrix #3	Matrix #3	Matrix #1
Middle	Matrix #1 (9 df)	Matrix #2	Matrix #1	Matrix #2
Worst	Matrix #2 (8 df)	Matrix #1	Matrix #2	Matrix #3

Some Comments:

1. The reproducibility estimate is very important for establishing accurate LTMS oil means and standard deviations (will affect calibration acceptance and severity adjustments). These can and should be updated as additional post-precision matrix data is obtained, but is often not done.
2. Engine run number effect is another important consideration. The current procedure allows only 5 runs. This could be a pro or a con of design #1 (may change procedure to allow 6 if no differences are observed, or may invalidate some tests if questionable data is the outcome). Matrix #2 never observes 5th run data.

Matrix #1

Stand A-1	Stand B-1
HWO	LWO
LWO	HWO
LWO	HWO
HWO	LWO
HWO	LWO
LWO	HWO

Matrix #2

Stand A-1	Stand A-2	Stand B-1
HWO	LWO	LWO
LWO	HWO	HWO
LWO	LWO	HWO
HWO	HWO	LWO

Matrix #3

Stand A-1	Stand A-2	Stand B-1
LWO	HWO	HWO
HWO	LWO	LWO
HWO	HWO	LWO
LWO	LWO	HWO
LWO	HWO	HWO