

T-12 Phase I Oil Consumption Study

SOUTHWEST RESEARCH INSTITUTE®



Revised Study Plan

the red parts indicate what changed from the prior stage

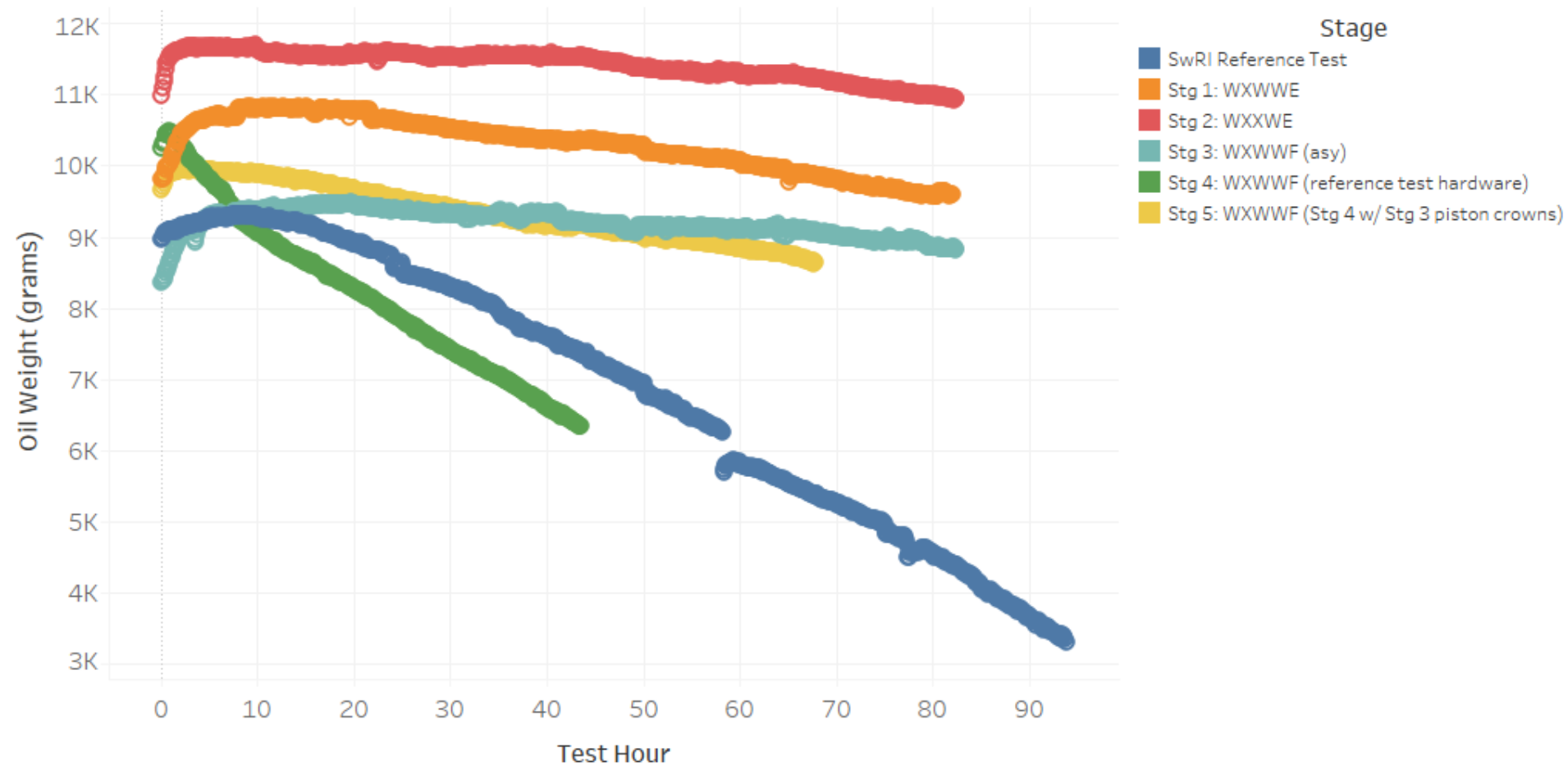
| | Stage 1 | Stage 2 | Stage 3 | Stage 4 *Installed SwRI Reference Test Hardware* | Stage 5 |
|-------------------------|-----------------------------------------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Current Hardware | 2 nd Rings (W) Oil Rings (W) Piston Crowns (E) | Oil Rings (W) Piston Crowns (E) | | *All of Cyl 6 and oil rings on Cyl 2 & 4 remained the same as Stage 3* | *Only changed piston crowns to those used in Stage 3. Liners and rings same as Stage 4* |
| New Hardware | Liners (W-TEI) | Liners (W-TEI) 2nd Rings (X-TEI) | Liners (W-TEI) 2 nd Rings (X-TEI) Oil Rings (X Asymmetric) Piston Crowns (F-TEI) | Liners (W-ref) 2nd Rings (X-ref) Oil Rings (X-ref) Piston Crowns (F-ref) | Liners (W-ref) 2 nd Rings (X-ref) Oil Rings (X-ref) Piston Crowns (F-TEI) |
| Phase 1 Oil Consumption | 20.6 g/hr | 21 g/hr | 15.2 g/hr Phase 2: 90 g/hr | 70 g/hr | 19.5 g/hr |

Stage 1 to 3 were on hardware provided by TEI. After stage 3 did not produce the expected high oil consumption like in the coordinated references, the hardware that remained after SwRI's terminated reference test were installed for stage 4 to reproduce high oil consumption conditions. Working backwards from the high oil consumption point, the newer-TEI provided piston crowns from Stage 3 were reinstalled for Stage 5 using the same reference-test liners and rings as stage 4, which brought oil consumption back down to reasonable levels.



Oil Consumption Trends

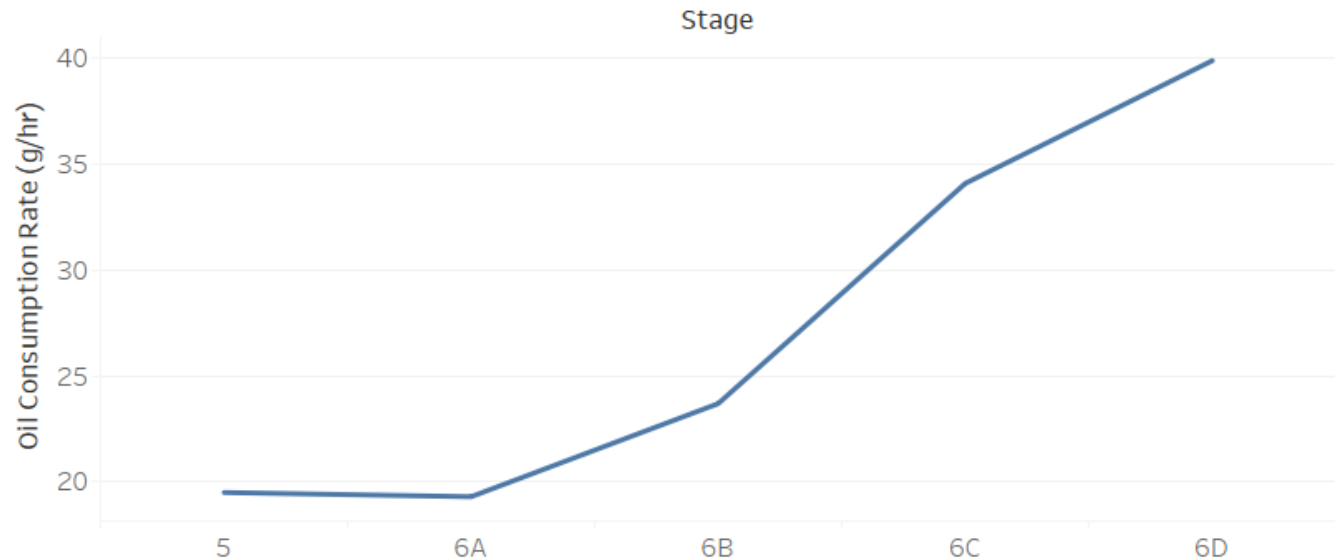
T-12 Phase 1 Consumption



Stage 6: Piston Crowns

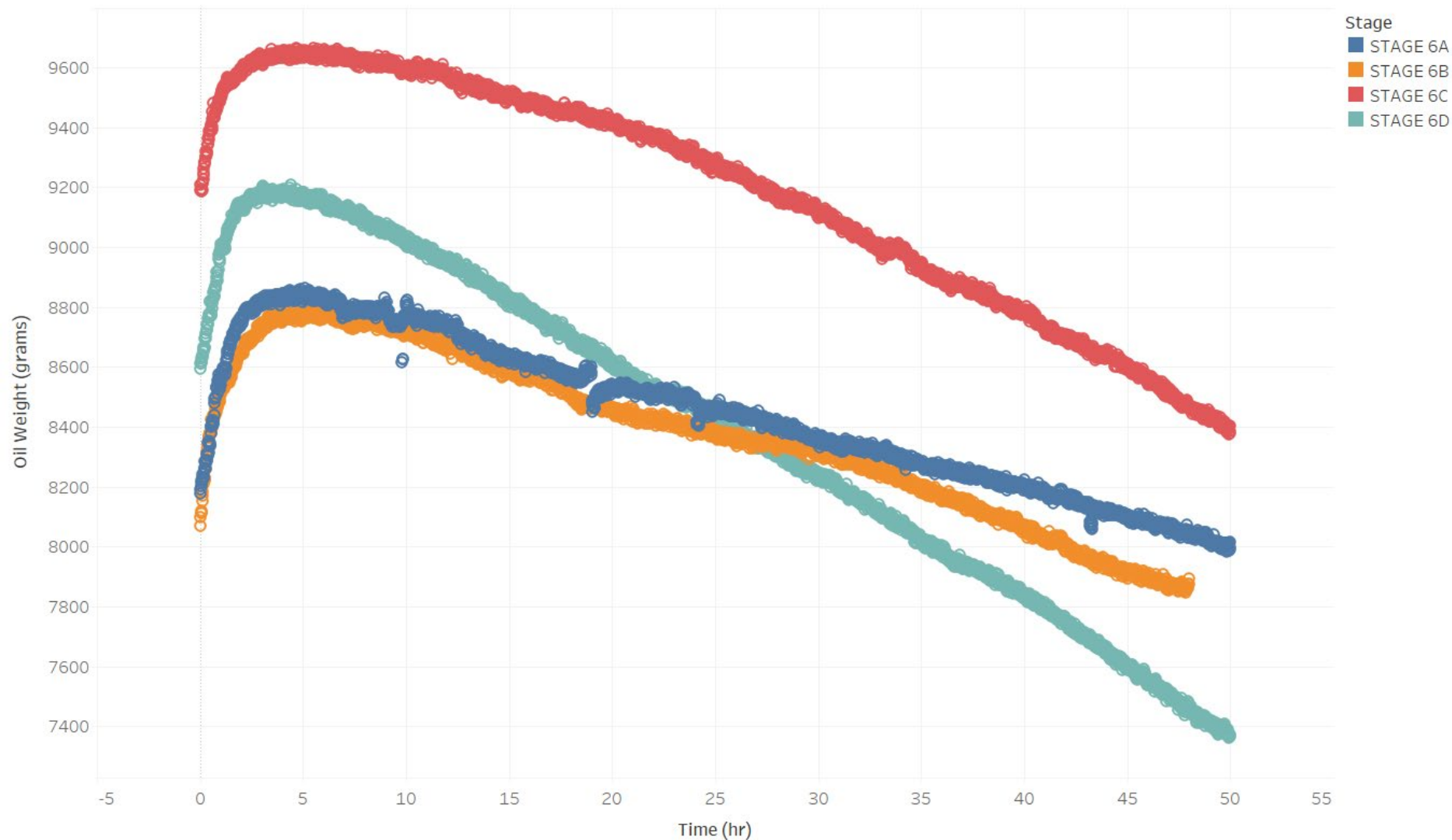
| | Stage 4 | Stage 5 | Stage 6A | Stage 6B | Stage 6C | Stage 6D |
|------------------------------------------------------|--------------|---------------|---------------|---------------|---------------|-------------------------|
| TEI Piston Crowns (Low OC in Stage 3) | Cylinder 6 | Cylinders 1-6 | Cylinders 2-6 | Cylinders 3-6 | Cylinders 4-6 | Cylinders 5-6 |
| SwRI Reference Piston Crowns (High OC in Stage 4) | Cylinder 1-5 | | Cylinder 1 | Cylinders 1-2 | Cylinders 1-3 | Cylinders 1-4 |
| Phase 1 Oil Cons. Phase 2 Oil Cons. | 70 g/hr | 19.5 g/hr | 19.3 g/hr | 23.7 g/hr | 34.1 g/hr | 39.9 g/hr 101.5 g/hr |

T-12 Oil Consumption Study: Stage 6



Stage 6: Piston Crowns

T-12 Phase 1 Consumption



Stage 6: Piston Crowns

| Cylinder | Stage 4 (High OC) | Stage 5 (Low OC) |
|----------|-------------------|------------------|
| 1 | S4941#167A | S4940#191 |
| 2 | S4941#169A | S4944#159D |
| 3 | S4941#145A | S4945#467E |
| 4 | S4941#158A | S4945#479E |
| 5 | S4941#175A | S4945#526E |
| 6 | S4945#850E | |