Burnthrough Update

International Aircraft Materials Fire Test Working Group Meeting

June 17, 2009

Köln, Germany

Outline

- **Background**
- **NexGen Burner Drawings**
- **Recent findings**

What is a NexGen Burner?

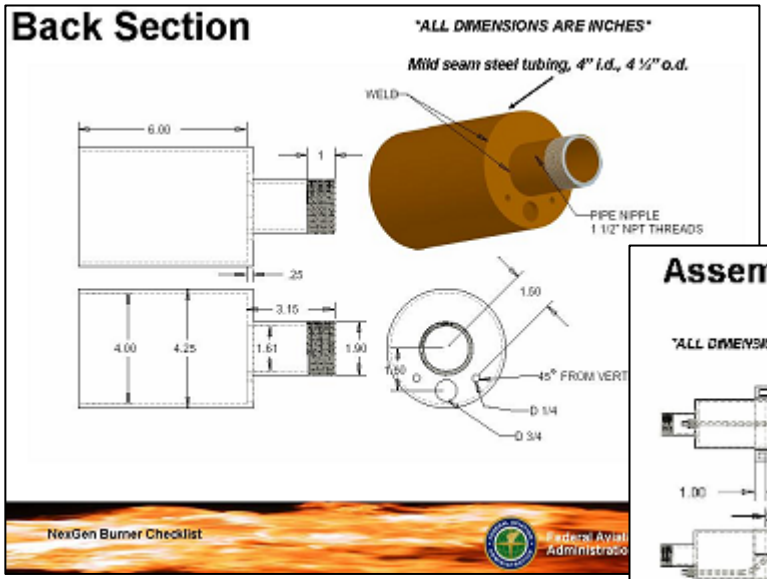
- **The next generation (NexGen) burner was designed by the FAA Technical Center to be used as an equivalent burner to the Park DPL 3400 which is no longer in production**
- **The NexGen burner relies on the same operating principles as the Park DPL 3400, which was designed for home heating purposes**
  - Oil burner fuel nozzle, 80°hollow cone, 6.0 gph
  - Air flow approx 1350 fpm exiting draft tube
  - Average flame temperature ~ 1900°F
  - Average flame heat flux ~ 15 BTU/ft^{2}s
- **The NexGen burner uses compressed air and fuel to supply the burner, whereas the Park DPL 3400 uses an electric motor to spin a blower fan and mechanical fuel pump**
  - Air Flow Metering:
    - Park uses a butterfly throttle valve
    - NexGen uses a sonic orifice
  - Fuel Pressure
    - Park uses pressure regulator on pump
    - NexGen uses fuel tank head pressure
- **Major advantages of a NexGen burner:**
  - Precise metering of inlet parameters
  - Can be constructed in-house with easily obtainable materials
  - Can be easily modified for future upgrades (as a result of FAATC research)

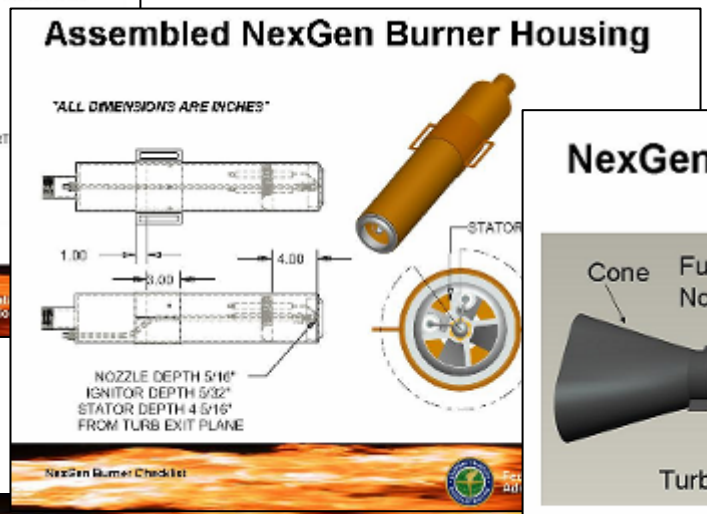
Park DPL 3400

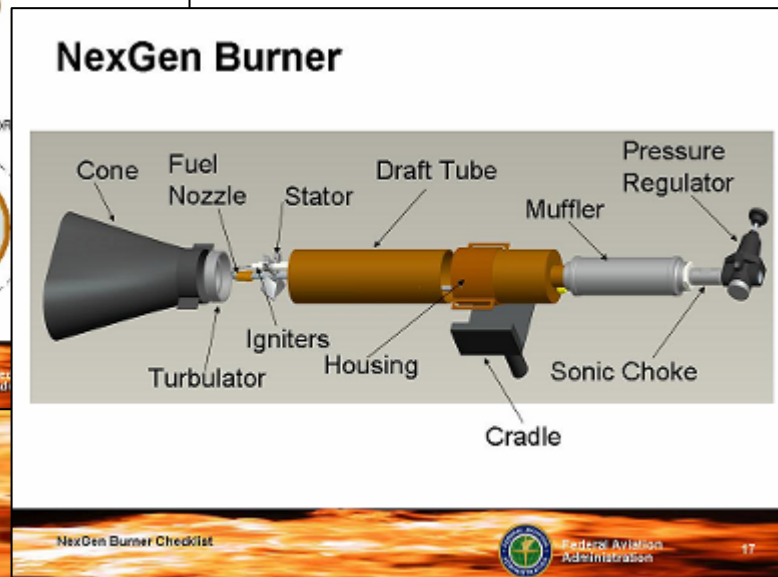
NexGen Burner

NexGen Drawings

- **Drawings are available online at**
  http://www.fire.tc.faa.gov/pdf/materials/NexGenPlans.pdf







Burnthrough Update

IAMFTWG, Köln, Germany

Update – Remanufactured Stators and Turbulators

- MarlinEngineering, Inc was able to digitize the original stator and turbulator
- Irregularities were corrected in design software, symmetry was restored to design
- A computer numerical controlled (CNC) mill was used to cut new, corrected stators and turbulators
- The new prototypes were sent to the FAA Tech Center for evaluation and comparison with a properly configured NexGen burner

Front View

Original Turbulator

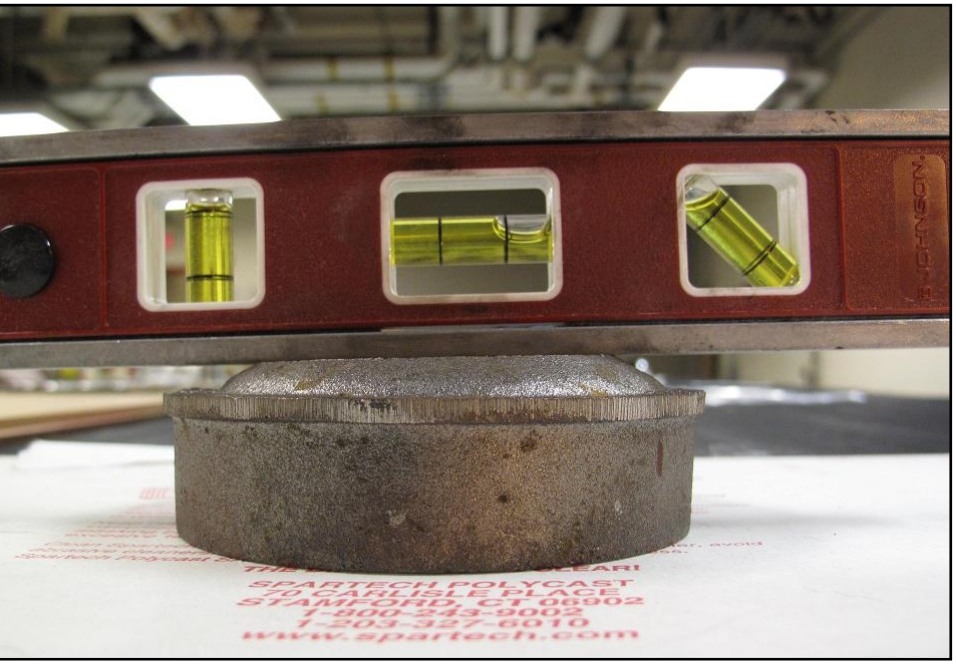
Prototype Turbulator

Rear View

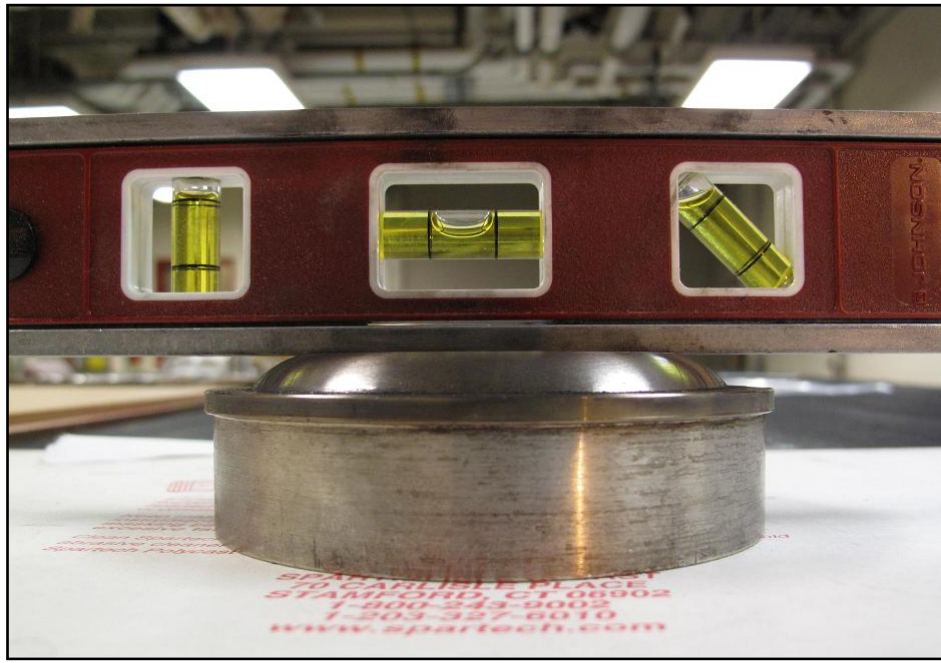
Original Turbulator

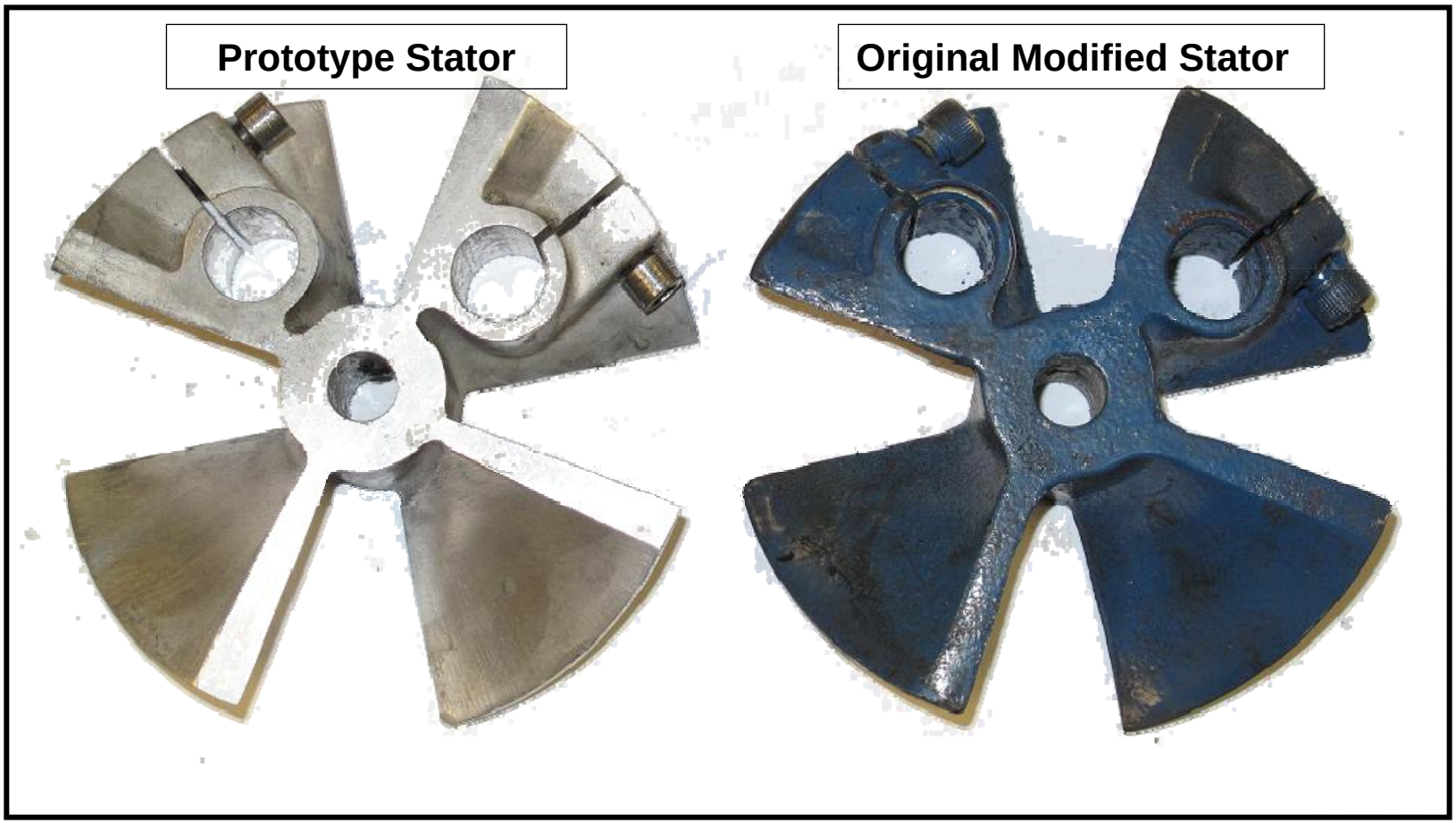
Prototype Turbulator

Original Turbulator



Prototype Turbulator

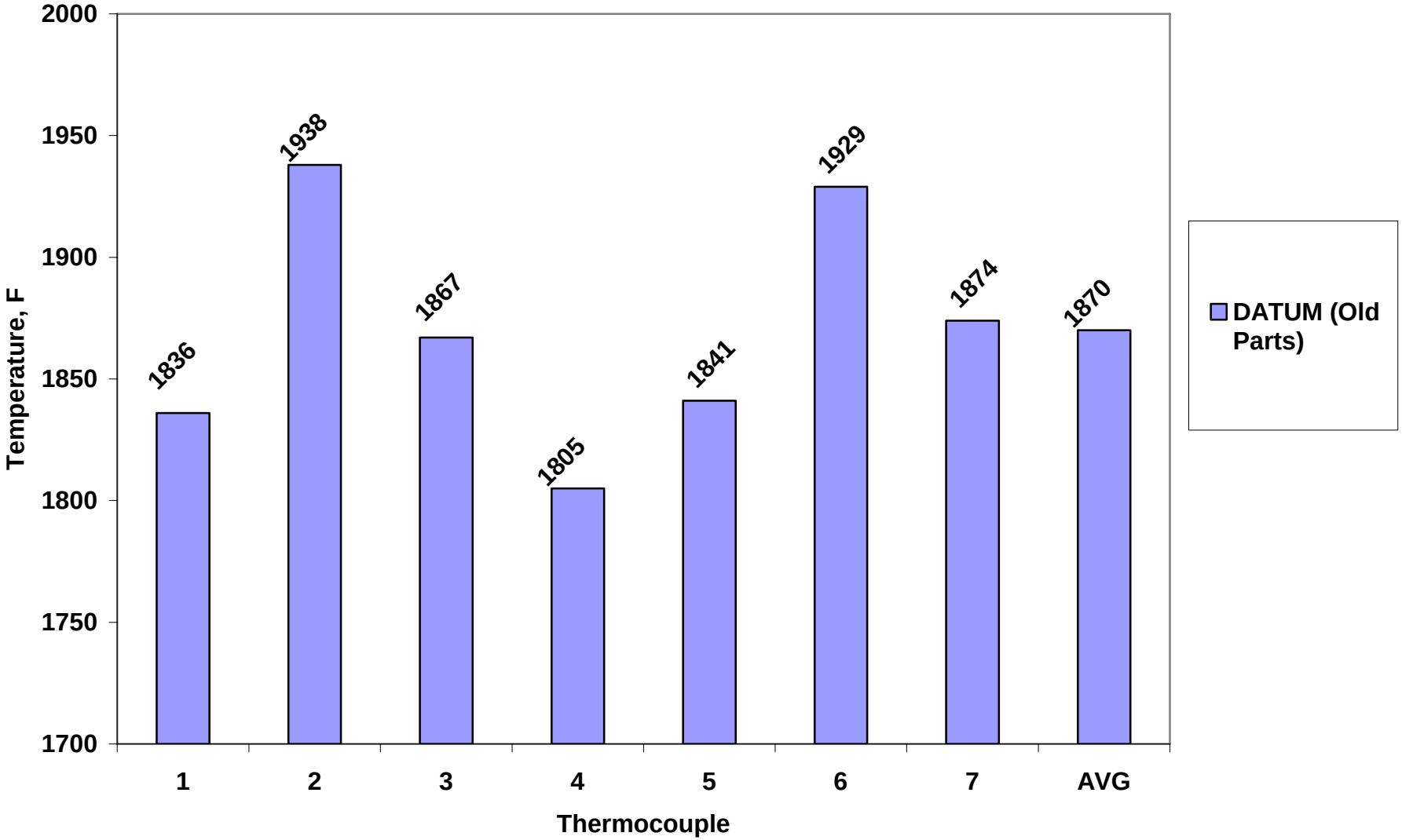



Prototype Stator
Original Modified Stator

Comparison Tests

- **Datum:**
  - FAA NexGen 2 burner
  - Constructed as per FAA NexGen burner guidelines (http://www.fire.tc.faa.gov/pdf/materials/NexGenPlans.pdf)
- **A new draft tube was made to fit the precise 4” round stator**
  - Original 4” i.d. pipe is not perfectly round
  - Stator could have been cut, but then we would have 2 imperfect parts
  - Tube was honed out to precisely fit the new stator
  - In the future, extruded tube with tight tolerance may be necessary for re-engineered CNC stators

Flame Temperature Measurements



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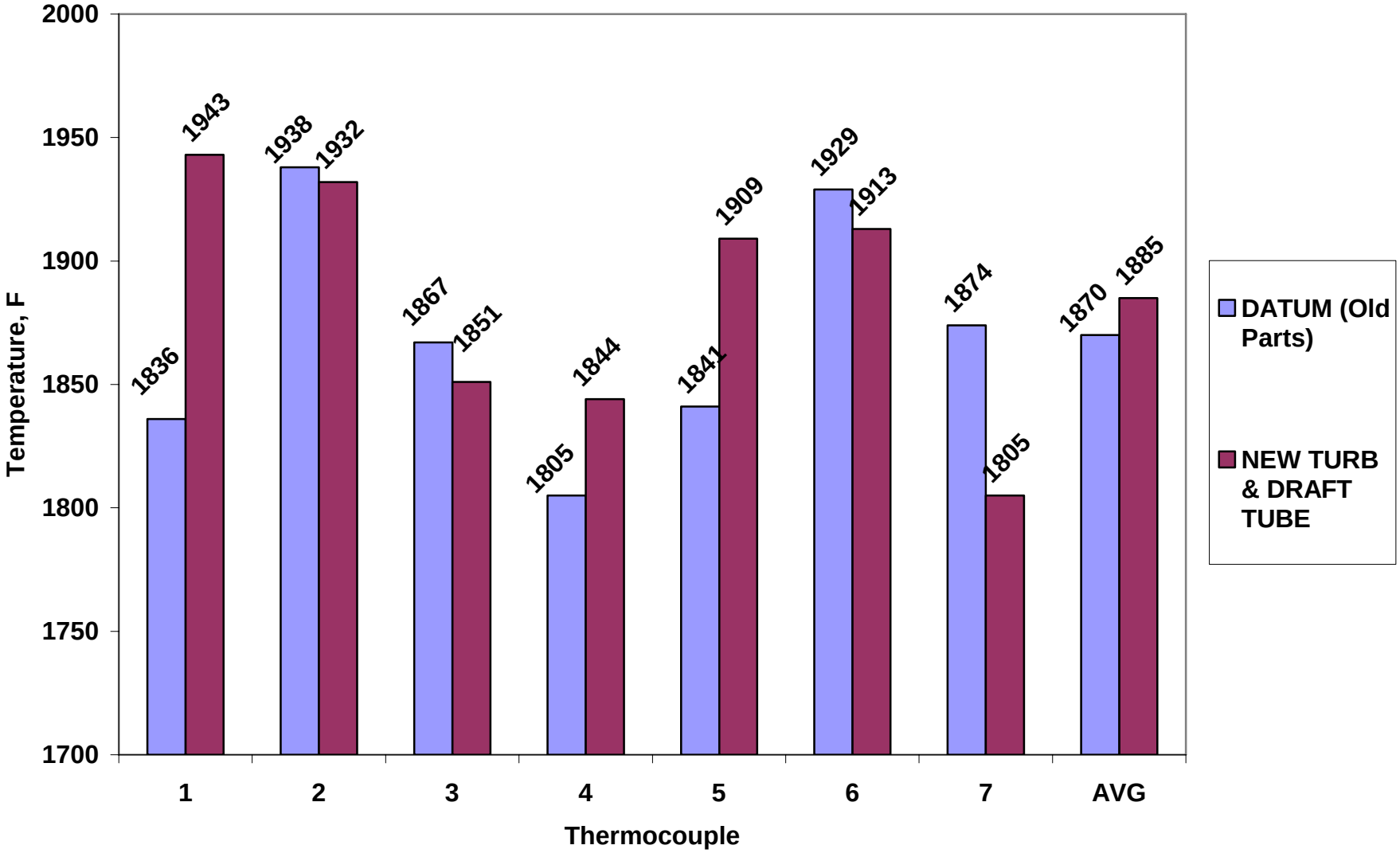
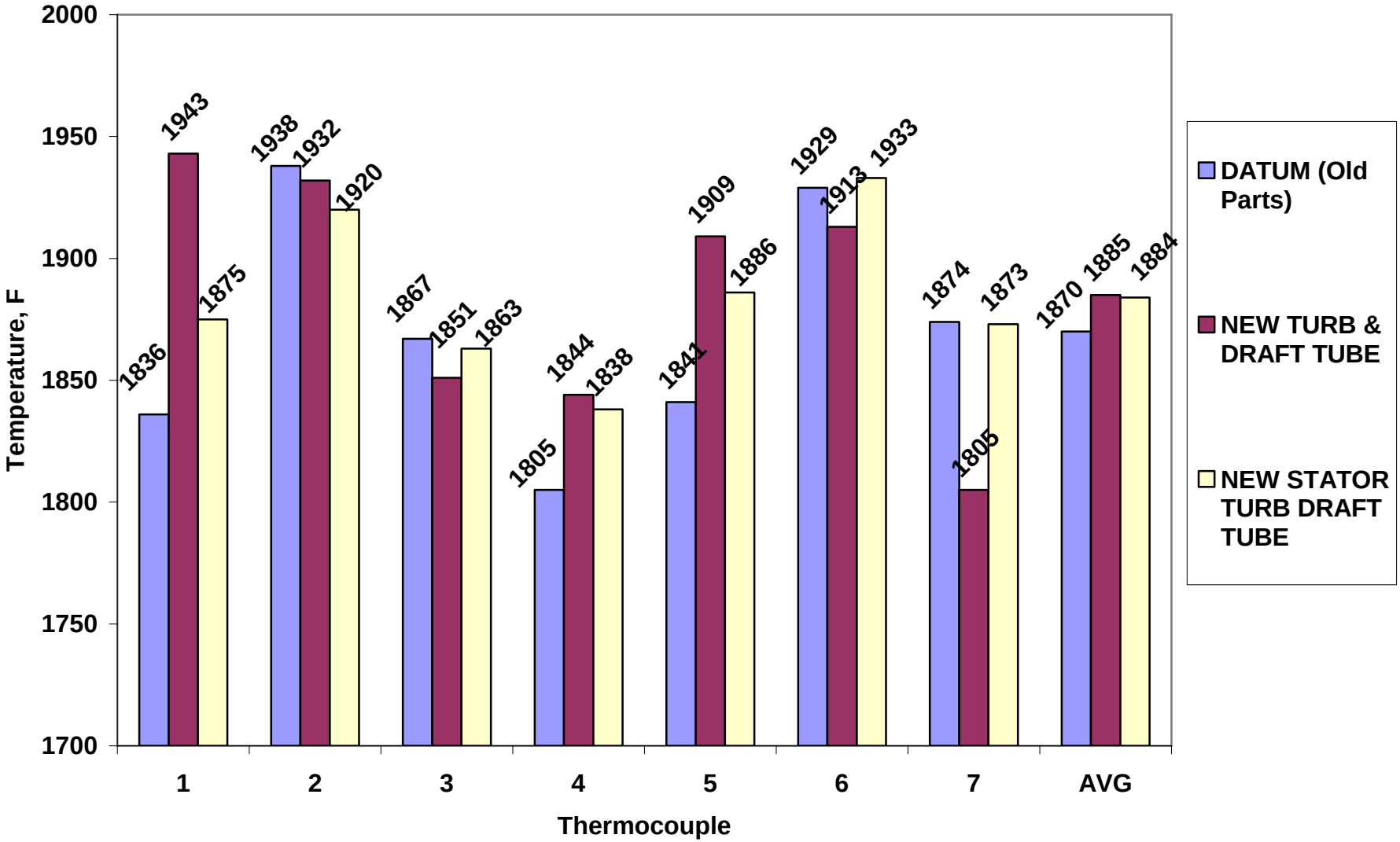


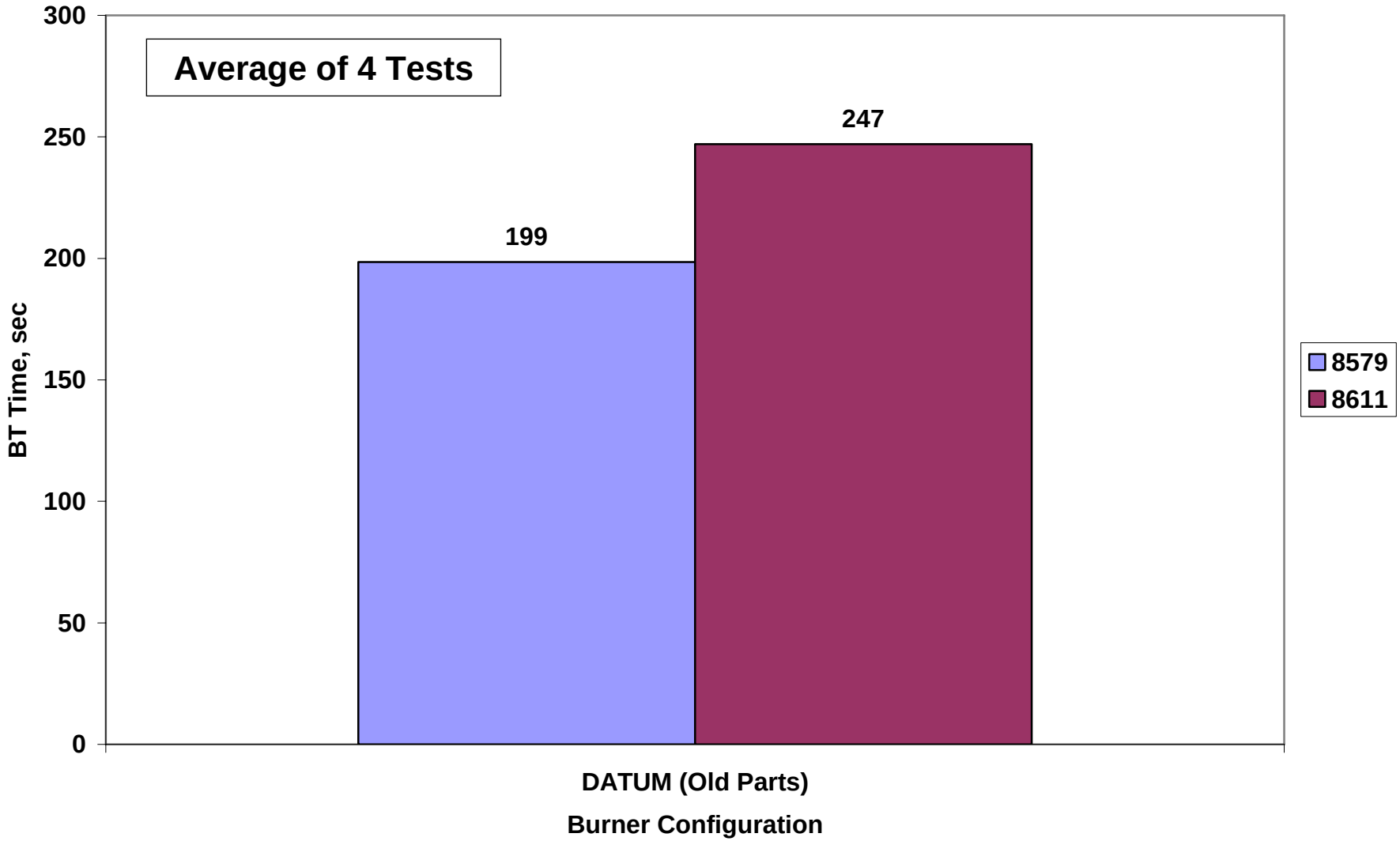
Flame Temperature Measurements



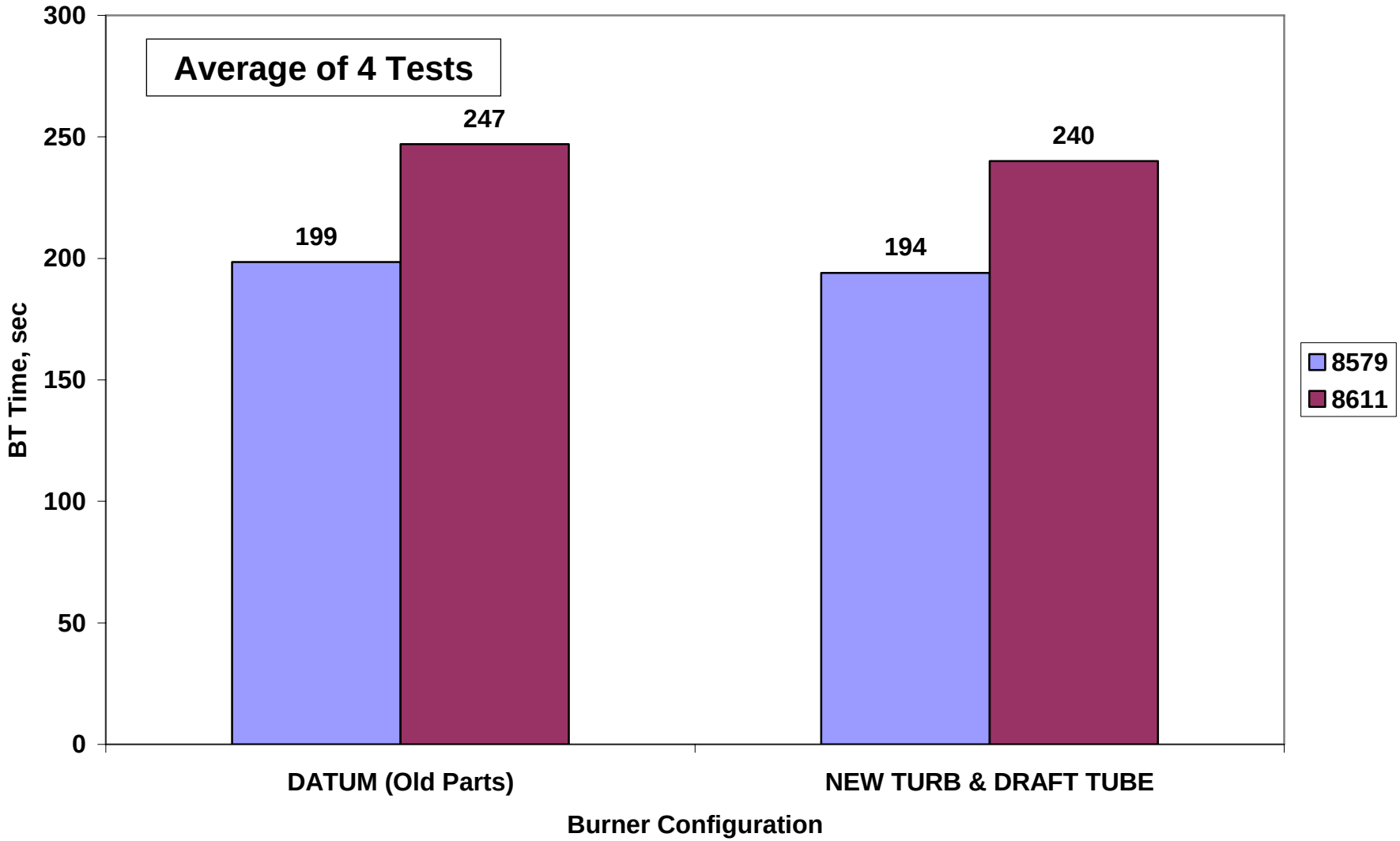
Comparison Tests

- **Testing was performed on the picture frame sample holder with polyacrylonitrile (PAN) materials of 2 densities**
- **Samples were kept in conditioning chamber until testing**

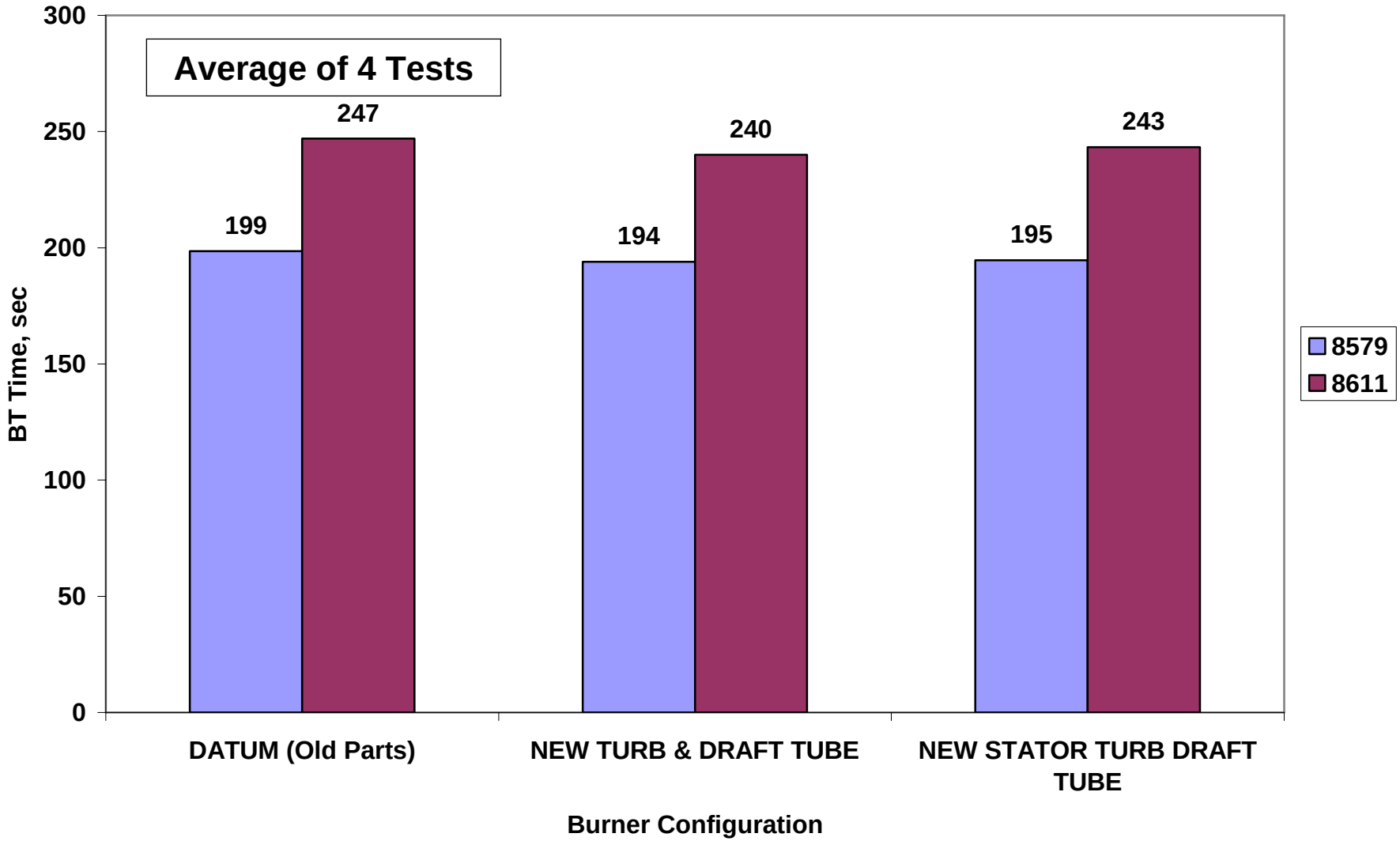
Picture Frame BT Times



Picture Frame BT Times



Picture Frame BT Times



Results

- **The new stator and turbulator had no significant effect on overall flame temperature or burnthrough times of PAN materials**
- **These new parts could be considered equivalent to the Monarch H215 stator and F124 turbulator**

NexGen, Burnthrough, and PIV Task Group

- Discuss plans, construction of burner with those interested in building a burner
- Discuss remanufactured stator and turbulator
- NexGen burner for seat cushion testing

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