The JETS Challenge

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Challenge 54 — The Mellon Arena Challenge

Problem:

On January 10th, 2004, Texas Eastern in Uniontown set a new performance record by pumping 3.65 billion cubic feet of natural gas in a 24-hour period. Mellon Arena in Pittsburgh can be modeled as a semi-spherical (half sphere) with a diameter of 550 ft.

At the record rate of gas flow, how long would it take (minutes) to move enough gas to fill the volume of Mellon Arena?

Solution:

Mellon Arena

$$Volume = \frac{1}{2} \cdot \frac{4}{3} \pi r^3$$

$$= \frac{1}{2} \cdot \frac{4}{3} \pi \left(\frac{550}{2} ft \right)^3$$

$$= 43{,}556{,}873\, ft^3$$

Rate of Gas Flow

$$\frac{3.65 \text{ billion ft}^3}{24 \text{ hrs}} = 152{,}083{,}333 \text{ ft}^3/\text{hr}$$

Time to Fill

$$\text{Mellon Arena} = 43{,}556{,}873\, ft^3 \cdot \frac{24 \text{ hrs}}{3{,}650{,}000{,}000} \cdot \frac{60 \text{ min}}{1 \text{ hr}}$$

=17.184 minutes