

The JETS Challenge

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Challenge 65 – The Barrel Challenge

Problem:

Your company has just been awarded a contract to manufacture new construction barrels on the PA Turnpike. It is assumed that 4% of the 500 kilometer length is under construction at any given time. Barrels must be located every 30 m of the section under construction. Each barrel can be modeled as three collapsing cylindrical sections of 35 cm high each. The bottom ring measures 70 cm in outside diameter, the middle ring is 68 cm in diameter and the top ring is 66 cm in outside diameter. The plastic material is 1 cm thick.

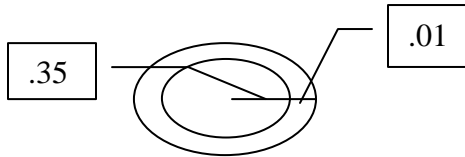


How many cubic meters of orange plastic material will be required to manufacture the number of barrels required?
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Solution:

$$4\% \text{ of } 50 \text{ km} = 2 \text{ km} = 20,000 \text{ m}$$

Barrells every 30 m \Rightarrow $666.\bar{6}$ barrells plus one at beginning
668 barrells



	70 cm diameter	68 cm	66 cm
Area (of cross-section material)	$A = \pi(.35)^2 - \pi(.34)^2$	$A = \pi(.34)^2 - \pi(.33)^2$	$A = \pi(.33)^2 - \pi(.32)^2$
Volume = $(.35)$	$[\pi(.35)^2 - \pi(.34)^2] +$	$[\pi(.34)^2 - \pi(.33)^2] =$	$[\pi(.33)^2 - \pi(.32)^2]$

$$= (.35) [\pi(.35)^2 - \pi(.32)^2]$$

$$= (.35) (.0201 \pi)$$

$$= 0.0221 \text{ m}^3$$

$$668 \text{ barrells at } 0.0221 \text{ m}^3$$

$$\text{Total value} = 14,764 \text{ m}^3$$