

Rn Emanation from Cleaned PP pipes

H.W. Lee, M. Shatkay, K. McFarlane, P. Gerard, J. Tan

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A special batch of polypropylene piping was made for the SNO project by Caledonia Plastics (Toronto) in July 1994. These pipes were made from Himont SV258 beads which previously had been identified as the "cleanest" beads available.

The beads are poured into a hopper and heated to form a melt. The melt is continuously extruded through a stainless steel die to form the (hot) pipe. The pipe then goes through a long cooling water bath (only the outside is in contact with the water) and is cut to 12 foot lengths. The lengths are put into long plastic bags (10 to a bag), stored in large particle board boxes and then shipped to CRPP.

By the time they arrive at CRPP and the boxes are opened, some of the bags have small tears on the ends and elsewhere and there is some dust on the outside of the bags. We have to determine the method and degree of cleaning needed on the piping before they are used on the SNO water systems.

Two batches of 5.1 cm ID pipes were prepared. Batch A of piping had Kimtuff (a towel form of Kimwipe) soaked in methanol (lab grade) pushed through once with a long length of small diameter PP piping. The Kimtuff did not fit very tightly into the pipe.

Batch B of piping was treated with 40 % Radiacwash (diluted with 20 parts water) scrub with a polypropylene brush, 60 % hot ultrapure water rinse and twice with Kimtuff soaked in methanol. The pipes were left to dry in the STC cleanroom (class 1000) and the ends were sealed with Parafilm.

Batch A and Batch B pipes were welded in the STC cleanroom into two long "U"s (the unions and elbows were ultrasonically cleaned with Radiacwash and weak nitric acid and rinsed in ultrapure water). Each U is 15.8 meters long giving a total internal area of 2.5 m². The open ends of the U were joined together with clean 3/8 inch copper tubing and a Nupro ball valve was added to seal the U. Because of time pressure we could not leak check and pump the U-pipes extensively (to a low base pressure) before sealing them for extraction 1.

The radon emanation results to date are as follows (there is a 7 to 14 day seal time between the extractions below):

Ext 1	U-Pipe A	6.0 +- 0.2	Rn per m ² per hour
	U-Pipe B	4.8 +- 0.2	
	A leak check revealed small leaks (5 x 10 ⁻⁶ cc/sec) in U-Pipe A and B in the Swagelok fittings. These were fixed and a week passed before Ext 2.		
Ext 2	U-Pipe A	0.64 +- 0.08	Rn per m ² per hour
	U-Pipe B	0.62 +- 0.08	
Ext 3	U-Pipe A	0.3 +- 0.1	Rn per m ² per hour
	U-Pipe B	7.0	(there was lots of gas inside U-Pipe B.

A subsequent leak check revealed a large leak at a Swagelok fitting. This was fixed and a week passed before Ext. 4)

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Ext 4 U-Pipe A <0.14 Rn per m2 per hour
U-Pipe B 0.19 +- 0.05 Rn per m2 per hour

Ext 5 U-Pipe B <0.14 Rn per m2 per hour

From the sequence of the extractions one can see that once the pipe is leak tight (and remains leak tight), the measured radon emanation rate drops as a function of time until it is below the limit of sensitivity.

The limits established on both pipes imply that both are similar to the raw SV 258 beads and that there is no observable difference in the two cleaning methods (for the 2.5 m2 of pipe tested) in terms of removal of radioactive contamination.