§9. Weight Saving of On-Site Radiation Monitoring Cart

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An on-site radiation monitoring cart was developed by conceptually mounting devices on a proper rover rack. The devices to be mounted were selected from commercially available ones, which was necessary for radiation monitoring according to the Japanese radiation law. The selected devices included a liquid scintillation counting system, an alpha/beta radiation measurement system, a dust sampler, survey meters and so forth. The rover rack was also designed so that all the selected devices could be mounted on it.

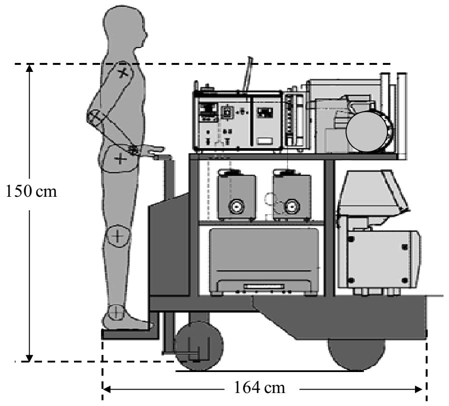

Fig. 1 First designed radiation monitoring cart.

The first cart was designed as a battery-powered electric cart as shown in Fig.1, on which a person could ride. The cart had the dimensions of 164 cm wide, 150 cm high and 80 cm deep. Its weight was 729.5 kg. The dimensions were acceptable as an actual cart, but the mass of the cart was too heavy to move smoothly and safely on the floor. Considering a usual withstand load of floor, weight reduction larger than half is necessary.

Table 1 Weight saving for devices mounted on the monitoring cart

Component device	Weight of devices	
	Before Weight saving	Result of Weight saving
1. Tritium gas monitor	15	15
2. Hydrogen and carbon air sampler	25	25
3. Two dust samplers	14	14
4. Liquid scintillation counting system	150	70
5. Alpha/beta measuring system	200	50
6. Germanium spectroscopy system	7	7
7. NaI (Tl) survey meter	1.5	1.5
8. Neutron survey meters	9	9
9. Tritium survey meter	5	5
10. Data analyzer (laptop computer)	3	3
11. Electrically driven rover rack	300	115
Total	729.5	314.5

All devices mounted on the cart are listed with weight in Table 1. In Table 1, heavy devices are a liquid scintillation counting system and an alpha/beta radiation measurement system and an electrically driven rover rack. The summed mass of three heavy devices accounts for approximately 90% of the total mass of the cart. The following approaches were conceptually carried out to reduce the weight of the cart.

Table 2 Solutions of weight saving of the monitoring Cart

(1) Reduction of the samples measured at one time by using both the liquid scintillation counting system and the alpha/beta radiation measurement system,
(2) Removal of the shielding materials of the liquid scintillation counting system and the alpha/beta radiation measurement systems,
(3) Removal of dedicated device housing and embed of housing into the cart body,
(4) Removal of a top lid on superior opening and adoption of drawer case with the liquid scintillation counting system, and
(5) Adoption of a pushcart instead of a raidable cart for the rover rack.

Under five basic solutions listed in Table 2, weight saving of the cart was conceptually developed. The newly designed monitoring cart is a battery-assisted pushcart and the dimensions are 136 cm wide, 132 cm high and 77cm deep (See Fig. 2) Its weight was 305 kg. The dimension was one size smaller and weight was reduced by half as shown in the third column of Table 1.

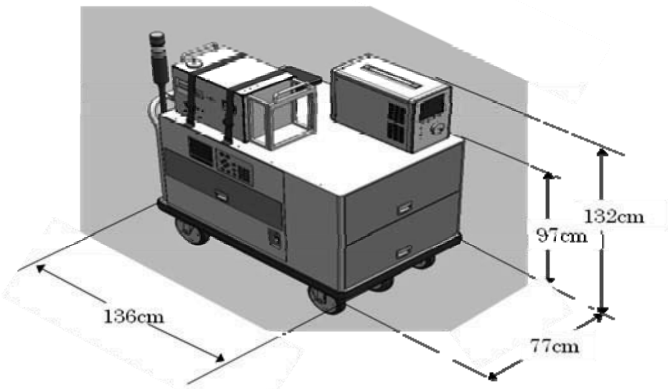

Fig. 2 Illustration of the radiation monitoring cart after weight saving.

It is conceivable that the removal of shielding materials will result in degrade of detection limit. The new cart will be re-evaluated by examining if it has performance enough to be used for radiation monitoring in work places and radiation controlled areas.