

Development of a 200 Liter-disposal Container (Drum) Cutting Machine for Nuclear Facilities

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1. Current technology status

In nuclear facilities, as for the same specifications as the disposal container, the drum has a upper band on the upper part and the bottom part of the drum is also ringed with a solid band. Disposal target drums are stored separately from permanent waste and clearance waste¹⁾ according to the radiation dose rate and surface contamination throughout scan survey. Clearance waste level drums are kept separately in a certain place. Both clearance and permanent waste drums are cut into appropriate sizes for disposal.

Clearance waste drums are then carry out decontamination and sampling process and permanent waste are stored in disposal drum. We normally use drum scissors, hydraulic scissors when cutting the drum which requires a lot of manpower since it is done manually. In this paper, we described the drum cut-off device that can be safely and efficiently cut to solve the problem of cutting the existing disposal drums.

2. Basis for development

Drum cutting machine is developed into two types. Curved cutter is designed to cut curved part of the drum and plane cutter is able to cut flat part of the drum. Also our drum cutting machine is designed to facilitate consumable replacement and maintenance, making it easy to maintain.

Furthermore, with simple education, workers can use the device easily, reduce work time and also cut drum in even sizes suitable for clearance waste requirement and disposal container size.

3. Development content

3.1 Curved Cutter (SKDC2 150A) specification



- 1) Operation system: Electricity, air (semi-auto)
- 2) Weight: 258 kg
- 3) Size: 1,300 W x 900 D x 1,300 H
- 4) Operation condition: 220 V (single phase), air compressor
- 5) Cutting motor: 1,800 W
- 6) Blade used: 9" (blade, tip-saw blade)
- 7) Rotator motor: BLDC 180 W
- 8) Airbag: tube extension up to 1.8~2 psi
- 9) Mobility: wheel movement
- 10) Cutting target: 200 L, 100 L, 50 L steel drum
- 11) Cutting speed: 1 drum/5 min (200 L base)

3.2 Plane cutter (SKDC2 150B) specification



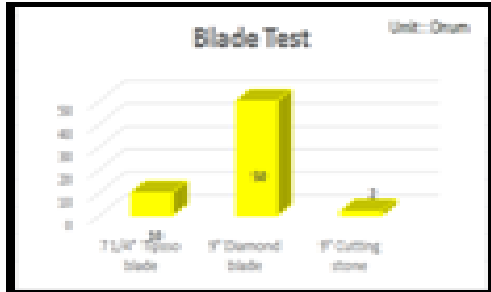
- 1) Operation system: manual
- 2) Weight: 166 kg
- 3) Size: 1,300 W x 900 D x 1,300 H
- 4) Operation condition: 220 V (single phase)
- 5) Cutting motor: 1,200 W (round saw)
- 6) Blade used: 7 1/4" (blade, tip-saw blade)
- 7) Mobility: wheel movement

8) Cutting target: 200 L, 100 L, 50 L steel drum

9) Cutting speed: 1 drum/5 min (200 L base)

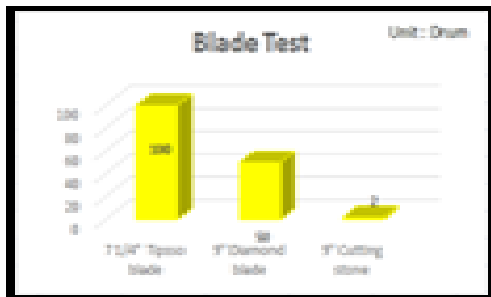
3.3 Blade test Result (200 L base)

○ No. Of drum cut by different blade



*Curved cutter (5.4 m/drum)

*Used self-manufactured diamond blade



*Plane cutter (2.58m/drum)

*plane cutter: used tip-saw blade

3.4 Curved / plane cutter advantages



- ① Active design (fast replacement of consumable supplies)
 - Easy to repair when trouble
 - Easy to disassemble which makes decontamination more comfort
- ② User-centered design
 - With simple education, users can operate the machine easily and save time

- ③ Scatter-free cover by using 3 mm iron plate for safety purpose (reduce scattering to prevent contamination)
- ④ Accurate cut performance and blade efficiency (1 blade to cut 90 or more drum)
- ⑤ reduce consumable supplies
- ⑥ ensure consistent cutting and even cutting sizes
- ⑦ Minimize exposure time in hazardous material space

4. Expectation and future application

4.1 Expectation

① By cutting disposal drums into appropriate size, we can reduce the porosity and number of the permanent waste drum.

Furthermore, as we can cut drums in appropriate shape for disposal, we can reduce the time and man-power spent on the operation.

② As to make radioactive-waste drums into clearance waste, we can cut drums into easy-decontamination and easy-sampling size, which will lead to reduction of the permanent waste.

③ By making scatter-free cover in the device, working place can be more safe to prevent any negligent accident.

4.2 Application plan

Applicable to other nuclear power plants and also general industry.

REFERENCES

- [1] The Solid Nuclear Wastes Management (SK-U2-radiation-200, 2017).
- [2] Clearance of Metal Nuclear Wastes (SK-U2-radiation-204, 2017).
- [3] Notify for Classification and Clearance of Nuclear Wastes (Nuclear Safety and Security Commission Notify, 2017-65).