Eco friendly condom production

PJ Reddy, Indus Medicare. December 2024

Requirements for production of a billion condoms

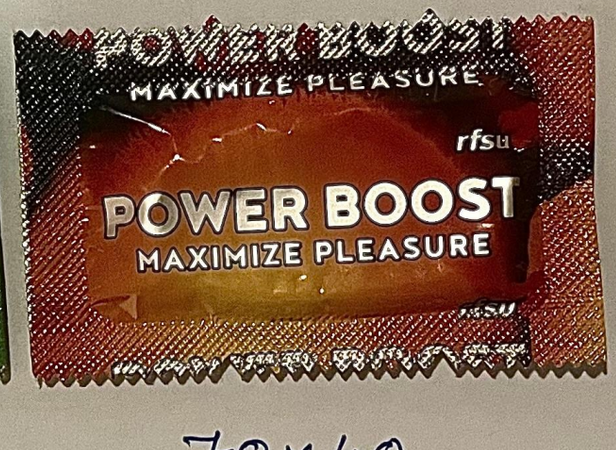
- Natural rubber requirement estimated at about 1700 tonnes
- Quantity of chemicals including lubricants estimated at 550 tonnes
- Quantity of packaging materials about 4300 tonnes

Potential areas for change

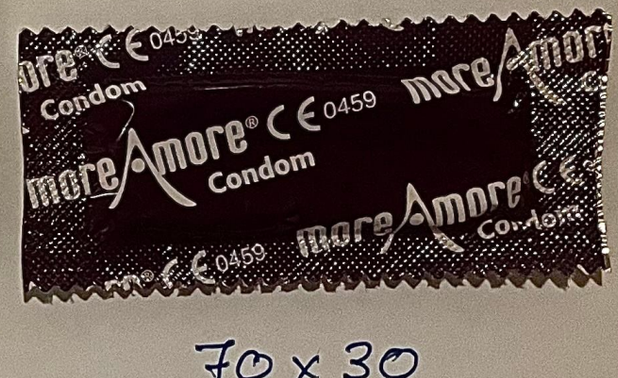
- Foil: reduce size.
- Remove aluminium or replace with other alternatives.
- Production of aluminium - high carbon foot print.
- Secondary and tertiary packing:
- Instructions for use leaflet.
- Recycled paper board, size and weight reduction.
- Fibre reinforced corrugated board to reduced weight.
- Use of recycled or biodegradable/compostable plastic liners/over wrapping.
- Optimisation of packaging sizes, pallet sizes to improve container loading.

55x55

70x45



70x40



70x30

Comparison of primary packs sizes and potential savings.

	Pack Size	cavity size mm	seal width mm	area of pack sq cm	Area of cavity sq cm	Total Seal area sq cm	Reduction in area wrt to normal
							Reduction WRTto A %
A	57x55	45x45	4-5	31.35	20.25	11.10	
B	70x30	53x20	7-8/4-5	21.00	10.6	10.4	33.0
C	70x40	54x28	7-8/4-5	28.00	15.12	12.85	10.68
D	60x40*	50x30	5/5	24.00	15.00	9.00	23.44
E	70x35*	55x25	7.5/5	24.50	13.75	10.75	21.85
							Reduction WRT to G %
F	70x45 (large condom)	55x34	5-6	31.5	18.70	12.80	14.28
G	60x60 (large condom)	50x50	4-5	36.00	25.00	11.00	

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DIFFERENT FOIL SIZES AND ITS SAVINGS COMPARED TO 57 x 55mm

	A	B	C	D
FOIL PACK SIZE	**70 X 30**	**70 X 35**	**70 X 40**	**57 X 55**
AREA OF PACK (MM	2100	2450	2800	3135
SAVINGS (WRT - D)	**33.01**	**21.85**	**10.69**	**0.00**
GROSS BOX SIZE	182 X 110 X 71	212 X 110 X 71	122 X 215 X 71	208 X 173 X 57
VOLUME OF BOX (C	0.00142142	0.00165572	0.00186233	0.002051088
SAVINGS IN SHELFBOX VOL.	**30.70**	**19.28**	**9.20**	**0.00**
MASTER CARTON (M	390 x 575 x 390	1085 x 245 x 390	270 x 1100 x 390	1075 x 365 x 320
VOLUME OF BOX (C	0.0874575	0.10367175	0.11583	0.12556
SAVINGS IN CARTON VOL.	**30.35**	**17.43**	**7.75**	**0.00**
CONTAINER LOADIN	28800	25200	24000	21000
EXTRA LOADING PALLETISED 40HC (W Ref T - D) (%)	**37.14**	**20.00**	**14.29**	**0.00**

LOADING CAPACITIES				
FOIL SIZE	**PALLET TYPE**	**PALLET SIZE**	**NO. OF PALLETS**	**LOADING**
70 X 30	EURO	1200 X 800	24	28800
70 X 35	AMERICAN	1200 X 1000	21	25200
70 X 40	ASIAN	1100 X 1100	20	24000
55 x 57	ASIAN	1100 X 1100	20	21000

The other alternate packaging is the removal of the aluminium layer from laminate. This would reduce the carbon footprint substantially.

Several manufacturers do pack product in non aluminised laminates.

Further, new laminates with better barrier properties are now available and it is worthwhile looking into these alternatives.

This suggests that the decline in tensile properties using the ISO 4074 ring sample may be due to rearrangement of the polymer chains, and it is particularly an artefact of ring samples. The effect on condom breakage rate is not clear. Further work to understand the phenomenon is needed.

For the inflation properties, 3 products showed a significant decrease in properties, and 3 did not. For those that were vulnerable to pack shape, the more the pack was constrained, the more the physical properties suffered. Nonetheless, even those that show a significant decrease would still pass the ISO 4074 requirements after 3 months at 50 °C.

It appears that reducing the volume of the package would not prevent some of the products from achieving a 5 year shelf life.

Whatever packaging materials are used, the manufacturer is still required under ISO 4074 and the WHO Male Latex Condom specification to demonstrate shelf life through real time and accelerated stability studies for the condom in its individual wrapper. Provided these studies are done successfully, different packaging shapes can be adopted with confidence.

ISO 4074 and the Male Latex Condom both implicitly link the fitness for use of condoms with compliance with the test requirements until the expiry date, after storage at 30 °C.

Moving to a rectangular pack would have a number of advantages:

1 Reduction in use of raw materials for primary packaging
2 Reduction in energy use in foil manufacture
3 Reduction in pollution from disposal of packaging
4 Reduction in packaging material costs
5 Reduction shipping costs, especially if the cost is volume-based.
6 Reduction in storage space required for the condoms
7 Users would be able to carry the condoms more discretely.

Therefore, if feasible, this change would be useful from an environmental, a public health and a cost point of view.

As the actual values of the physical properties have declined in some cases, it is not correct to assume that an unconditional move to the smallest packs for all factories is immediately possible.

Further work is therefore required, and could be done with the cooperation of those manufacturers who are currently producing the same design of condoms in both square and rectangular packs.

The most definitive result would be from a controlled cross-over breakage trial on condoms which have been stored for several years. Such trials are very expensive, and adequate alternative indications may be available from manufacturers' complaint records.

Further laboratory work could also be done to compare condoms from the same manufacturing batch that were packed in both square and rectangular designs. A better understanding of the reason for the decline in tensile ring properties, and for the difference in behaviour of the two groups of product on the inflation test, would help in reducing the size of the pack.

Meanwhile, further testing of expiring retained samples from those manufacturers who have packed the same design of condoms in both square and rectangular would shed more light on the situation.

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