

ON TO
THE SECOND
PLASTICS REVOLUTION

**WHAT CAN WE LEARN FROM
THE FIRST REVOLUTION**

Harry Lintsen

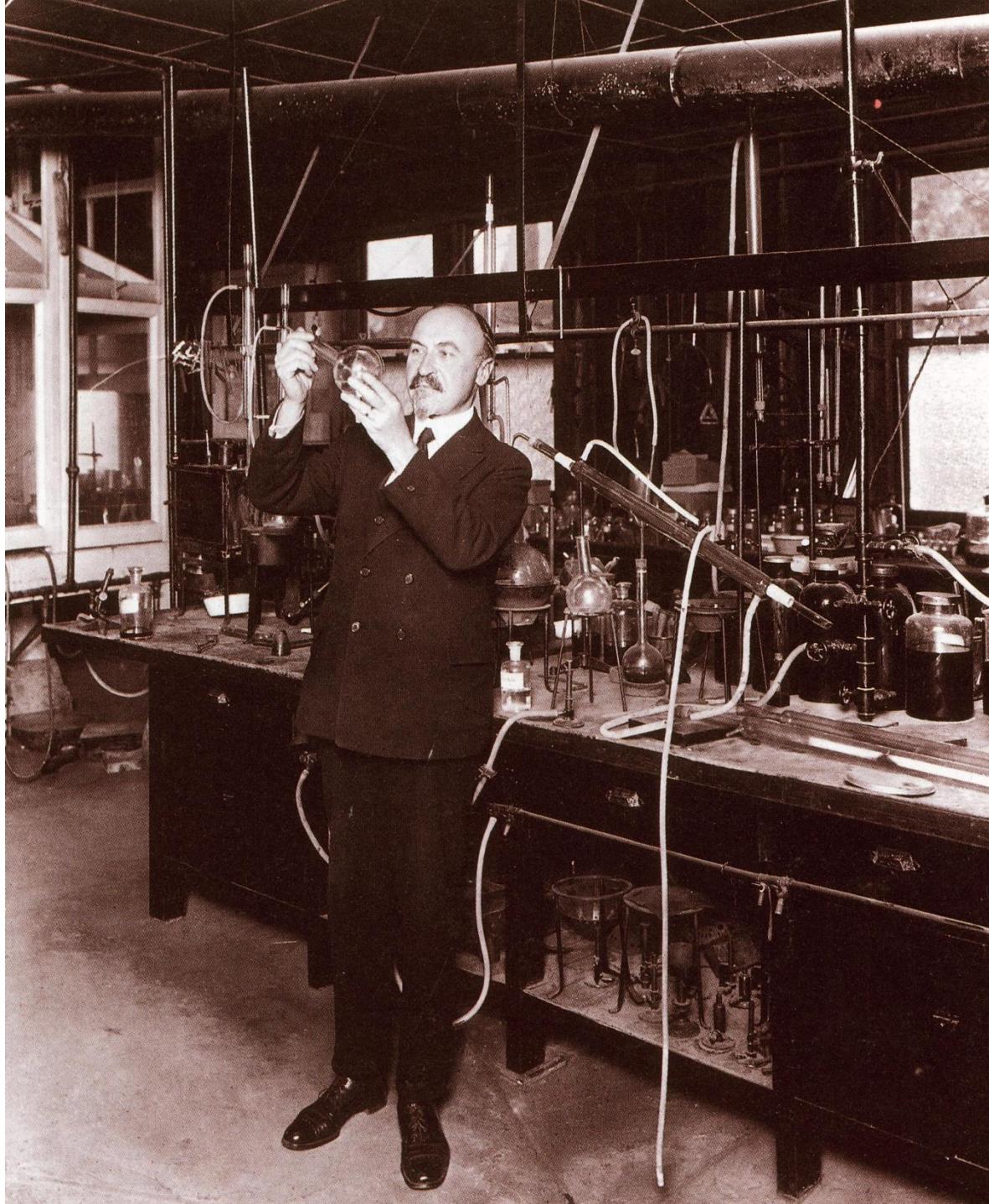


The Plastics Revolution

How the Netherlands Became a Global Player in Plastics

Harry Lintsen, Marijn Hollestelle and Rick Hölsgens





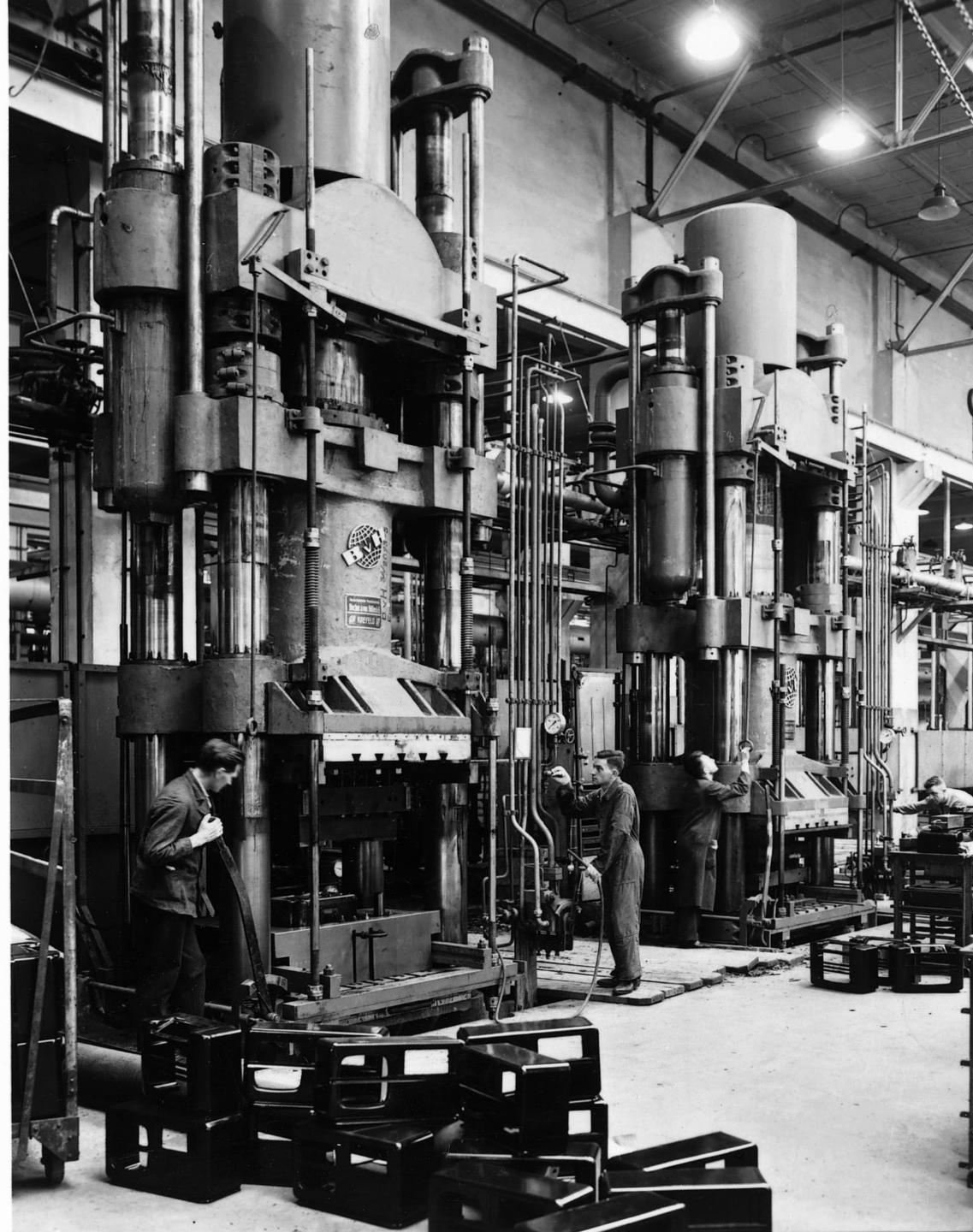


TABLE 1.1 World output of various materials, 1938-1970 (in millions of tonnes)

	1938	1950	1960	1970
Plastics:	0.31	2.12	8.25	36.0
- Synthetic rubbers	0.01	0.5	1.9	4.5
- Synthetic fibres	-	0.12	0.65	4.5
- Other synthetic materials	0.3	1.5	5.7	27.0
Crude iron	88	153	241	448
Aluminium	0.5	1.3	3.6	8.1
Copper	1.8	2.3	3.7	6.1
Zinc	1.4	1.8	2.4	4.0
Cotton	5.2	6.0	7.1	9.1
Wool	1.6	1.7	2.1	2.2
Natural rubber	0.92	1.9	2.0	2.9

SOURCE: UN Yearbook of Statistics (New York 1961); UN Monthly Bulletin of Statistics; C. Freeman and L. Soete, *The Economics of Industrial Innovation* (Third Edition, London 1987), 107, table 5.1

Where does this success story come from?

What are the pros?











But plastic is a disputed material

What are the cons?







WORLD PRESS PHOTO



Stomach content
Fulmarus glacialis
BFP-2155



The *Washington Post* wrote 'each one of us is just a little plastic'

Heather Leslie, a researcher of microplastics concludes that 'microplastics can damage cells and tissues and can lead to inflammation in the human body.'

How do we get rid of this addictive love affair?

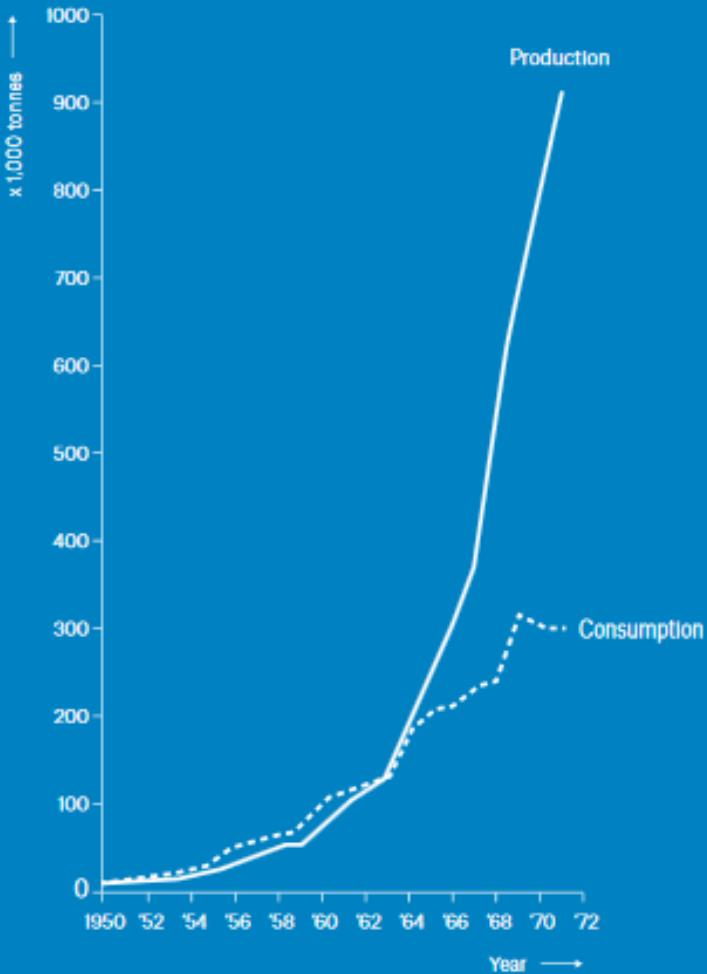
Abolishing plastics is not an option

We need a Second Plastics Revolution

First Plastics Revolution (1945-1970)

- Leaders: United States, United Kingdom and Germany
- At the beginning: The Netherlands fellow traveller
- Within 25 years: The Netherlands up front

GRAPH 3.1 Production and consumption of plastics in the Netherlands, 1950-1972



SOURCE: H.B. Spruijsma, '5 miljoen ton kunststoffen in 25 jaar', *Plastica* 25 (1972) 12, 543.
graph 1.

TABLE 3.3 Production, imports, exports and domestic consumption of the plastics producing industry in various countries in 1975

	Production (kton)	Imports (kton)	Exports (kton)	Domestic consumption (kton)	Net exports (kton)	Aggregate availability = production + imports = domestic cons.+ exports
US	9,626	76	1,002	8,620	926	approx. 9,662**
Japan	5,167	79	1,260	3,986	1,181	5,246
West Germany	6,446*	1,517*	2,431*	5,532*	914*	7,933*
France	2,030	911	901	2,040	-10	2,941
UK	1,968	335	363	1,940	28	2,303
Netherlands	1,376	409	1,450	335	1,041	1,785
Sweden	440	370	255	555	-115	810
Australia	366	133	34	455	-99	approx. 495**

source: 'Enige internationale statistische gegevens over kunststoffen', Plastics 31 (1978), no.1, 1, tables 2 and 3. See note 3 on the reliability of these figures.

* These figures refer to 1976.

** In these countries, the sum total of production + imports does not equal the sum total of domestic consumption + exports. The discrepancy is not very large. The figure quoted is the average of the two totals.

TABLE 3.6 Estimated plastic consumption per capita in various countries, in 1950, 1960 and 1971 (in kg per annum)

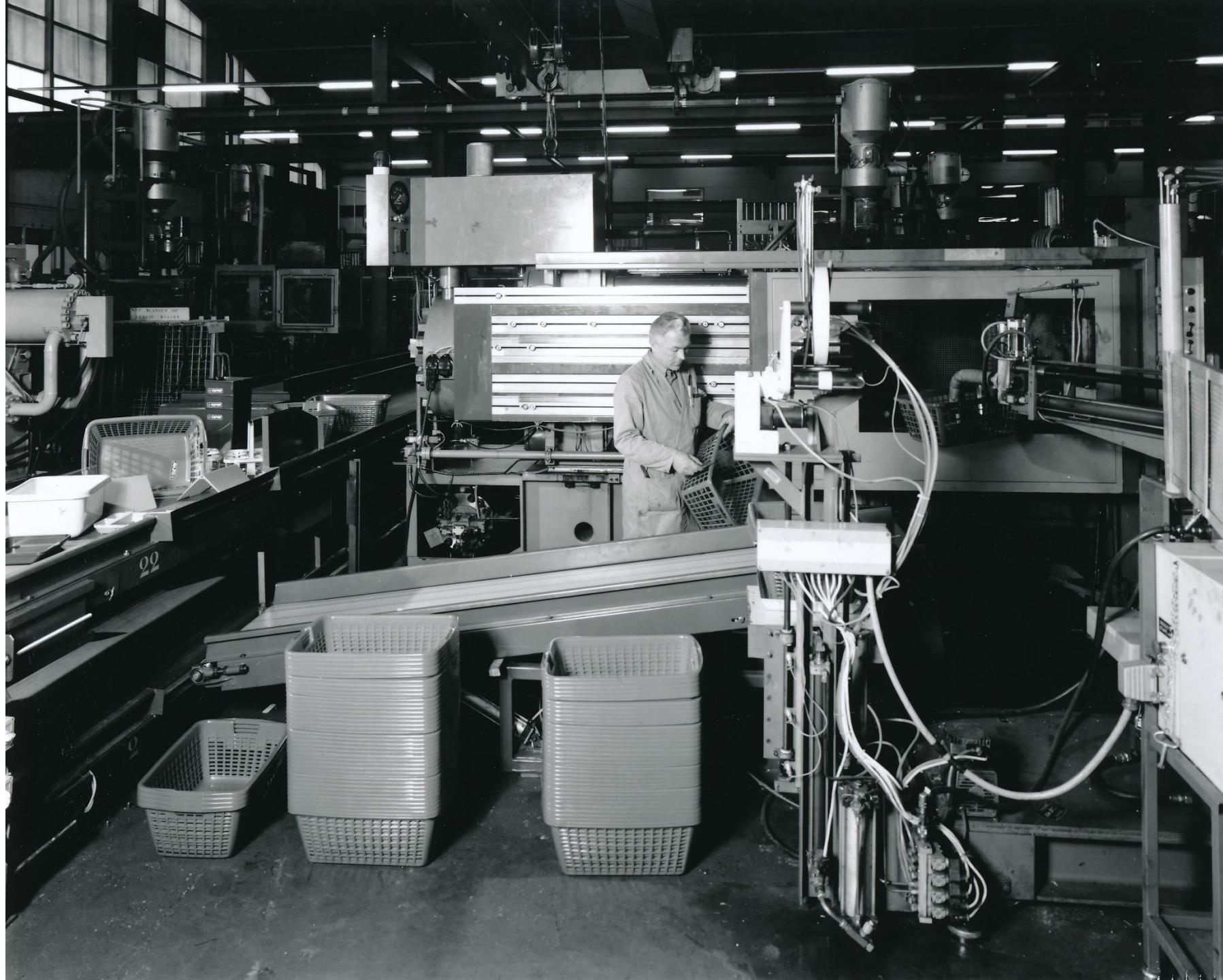
	1950	1960	1971
US	6.4	13.8	42
UK	2.3	8.7	27
West Germany	2.2	13.6	62
Netherlands	1.7	9.1	35
Italy	0.9	5.4	29
France	0.9	7.2	34
Japan	0.2	5.9	37
Sweden		11.0	35
World			9

SOURCE: A. E. Schouten and A.K. van der Vegt, *Plastics. Hoofdlijnen van de huidige kennis en toepassing van de synthetische macromoleculaire materialen* (Utrecht 1966, 5th edition 1974), 278, table 11.4.

First Plastics Revolution (1945-1970)

- Building up a sector for producing and processing plastics



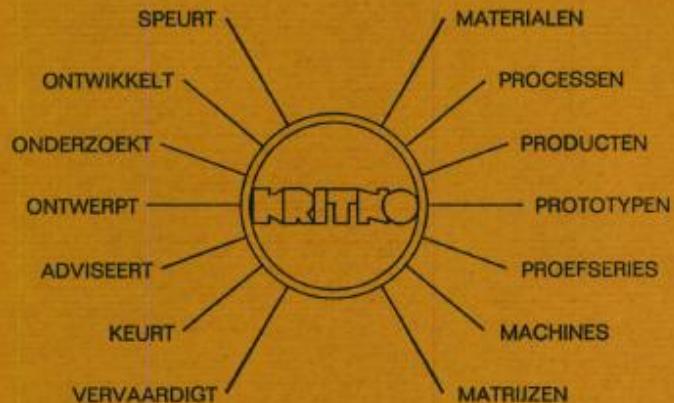


First Plastics Revolution (1945-1970)

- Building up a sector for producing and processing plastic
- **Building up a knowledge infrastructure**



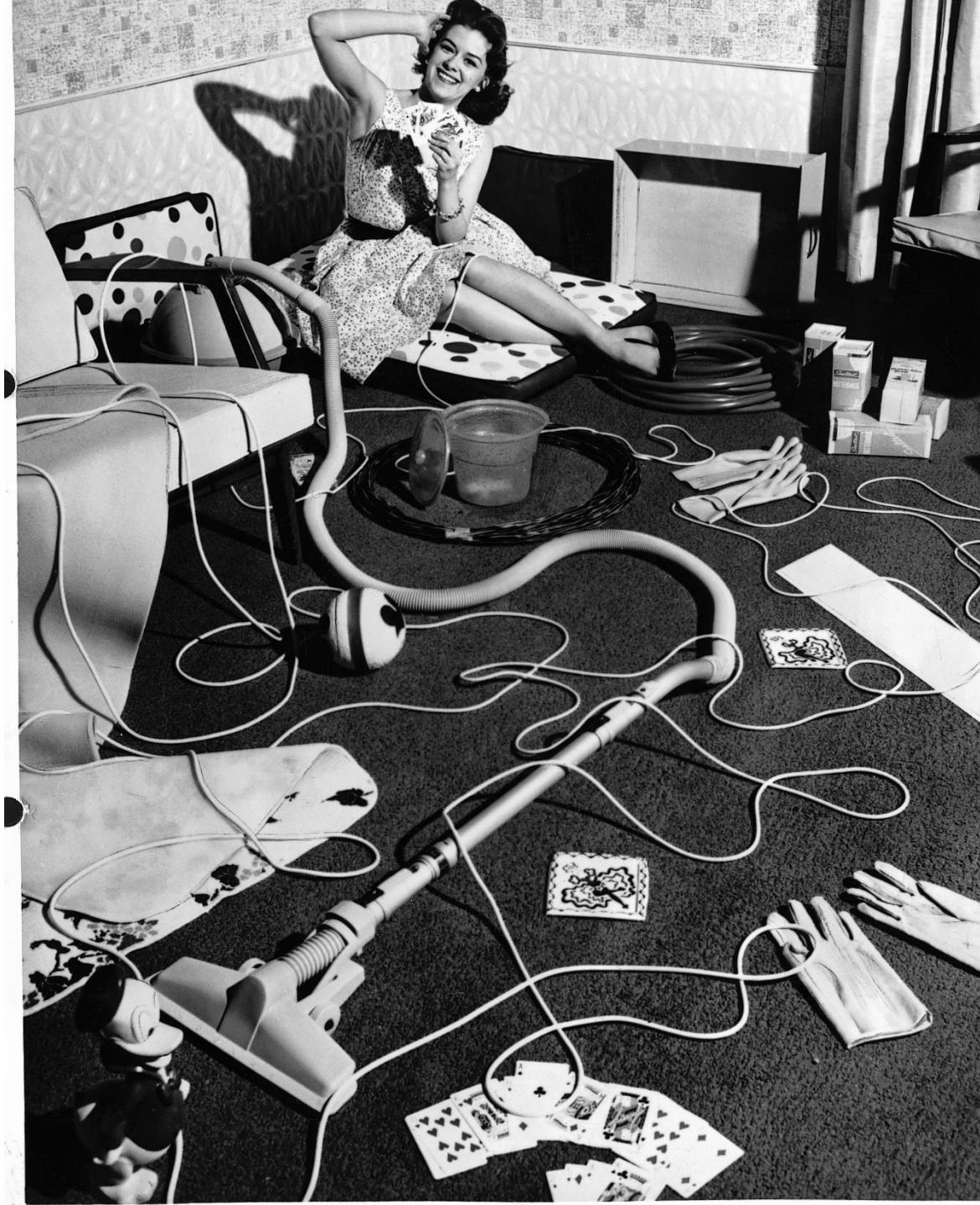
wat kan het KRITNO voor u doen?



KUNSTSTOFFEN EN RUBBER INSTITUUT TNO
SCHOEMAKERSTRAAT 97 — DELFT — POSTBUS 71 — TELEFOON 01730 - 37000 — TELEX 31453

First Plastics Revolution (1945-1970)

- Building up a sector for producing and processing plastics
- Building up a knowledge infrastructure
- **Creating a market for plastic products**







First Plastics Revolution (1945-1970)

- Building up a sector for producing and processing plastics
- Creating a market for plastic products
- Building up a knowledge infrastructure
- **Developing a policy and legislation for stimulating innovation, quality standards, healthy use, safety use, litter prevention and so on**



GRAPH 5.1 Household waste per capita, 1950–2013 (1950=100)¹⁰⁴



source: Statistics Netherlands, Netherlands Environmental Assessment Agency & Wageningen University and Research Centre (2014)

Note: The graph is based on the weight of household waste.

First Plastics Revolution (1945-1970)

- Building up a sector for producing and processing plastics
- Creating a market for plastic products
- Building up a knowledge infrastructure
- Developing a policy and legislation for stimulating innovation, quality standards, healthy use, safety use, litter prevention and so on
- **Creating a culture in which society accepts and adopts plastics**

What were the conditions for the First Plastics Revolution? (1945-1970)

- **Context:**
 - **A feeling of urgency**
 - **Coalfields in the south of the Netherlands and Rotterdam as most important international seaport**





What were the conditions for the First Plastics Revolution? (1945-1970)

- Context:
 - Coalfields in the south of the Netherlands and Rotterdam as most important international seaport
 - A feeling of urgency
- **R&D in niches:** Manager of DSM Central Lab: Plastics research is a lottery with very few ‘yes’ and loads of ‘no’s



What were the conditions for the First Plastics Revolution? (1945-1970)

- Context:
 - Coalfields in the south of the Netherlands and Rotterdam as most important international seaport
 - A feeling of urgency
- R&D in niches
- **Platform of producers, users, researchers and developers**

TABLE 3.8 Leading plastics producers in the Netherlands in 1973

Name of company	Type of plastic produced
DSM	PVC, polyethylene, polypropylene, ABS, SAN, melamine resins
Shell	PVC, epoxy resins
RPM*	Polypropylene
AKU	Nylon, PETP (fibre)
Foreign companies:	
- Dow Chemical	Polyethylene, polystyrene, ABS, SAN
- ICI	Polyethylene, nylon, PMMA, PETP (film)
- Hoechst	Polystyrene
- RPM*	Polypropylene
- Marbon	ABS
- General Electric	Noryl, PC
- DuPont	POM, PTFE

SOURCE: A. E. Schouten and A.K. van der Vegt, *Plastics. Hoofdlijnen van de huidige kennis en toevoeging van de synthetische macromoleculaire materialen* (Utrecht 1966, 5th edition 1974), 280-281, table 11.3. See also: H.B. Spijkersma, 'De Nederlandse kunststoffen-industrie in 1970', *Plastics* 24 (1971) 5, 198, table 1.

*RPM was 60%-owned by Shell.

What were the conditions for the First Plastics Revolution? (1945-1970)

- Context:
 - Coalfields in the south of the Netherlands and Rotterdam as most important international seaport
 - A feeling of urgency
- R&D
- Platform of producers, users, researchers and developers
- **Dominant ‘owners’ of certain problems**



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WHAT CAN WE LEARN FROM
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On to the Second Plastics Revolution: from a linear to a circular plastics society

We have to close the loop of the plastics value chains, especially those of fossil based plastics.



What are the conditions for the Second Plastics Revolution?

- Context:
 - Rotterdam as the main harbour of Europe
 - A feeling of urgency
- R&D in niches
- Platform of producers, users, government, researchers and developers
- Dominant ‘owners’ of certain problems

A new role for Dutch Polymer Institute:

creating platforms and
taking ownership in research
for closing loops

