

Trends in World Bleached Chemical Pulp Production: 1990-2002

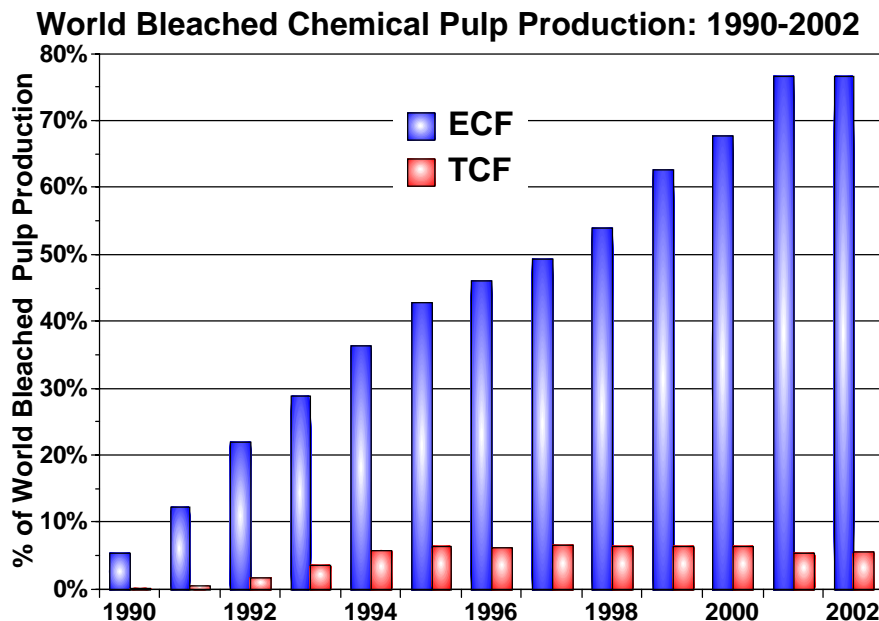
SUMMARY

Elemental Chlorine-Free (ECF) pulp, bleached with chlorine dioxide, continues to dominate the world bleached chemical pulp market. In 2002, ECF production reached over 64 million tonnes, totaling more than three-quarters of world market share. In contrast, TCF (Totally Chlorine-Free) production maintained a small niche market at just over 5% of world bleached chemical pulp production.

ECF is acknowledged as a core component of Best Available Technology (BAT). New studies continue to document ECF's compatibility with sustainable ecosystems, and papermakers' desire for ECF's superior product quality remain unabated. With such strong attributes, the new bleached chemical production coming to the market in the next few years will use ECF-based bleaching technology.

WORLD BLEACHED CHEMICAL PULP PRODUCTION PROFILE

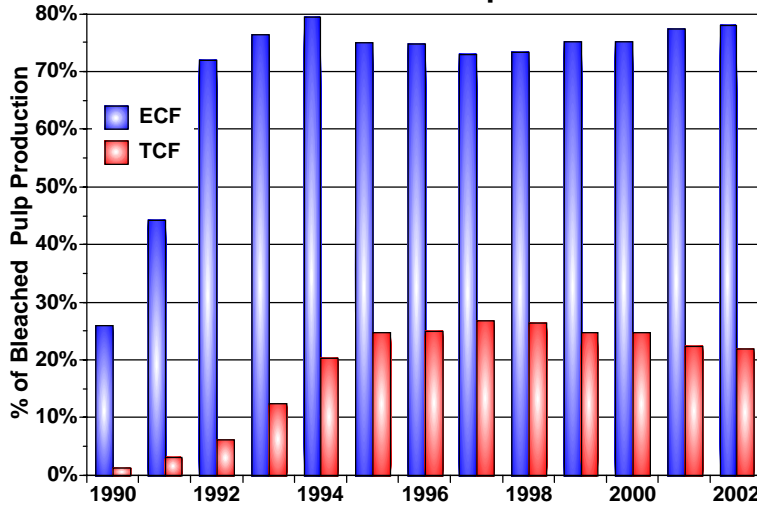
In 2002, ECF commanded the highest worldwide market share at greater than 75%, totaling more than 64 million tonnes. ECF market share continues to grow in all pulp producing regions. This trend will continue as new production planned in Chile, Brazil, Germany, and China - incorporates ECF bleaching.



Scandinavia

In Scandinavia, ECF accounts for over 78% of bleached chemical pulp production. Conversely, TCF market share peaked in 1997, and has modestly declined over the last 5 years as a number of companies producing TCF on a campaign-basis have exited the market [1].

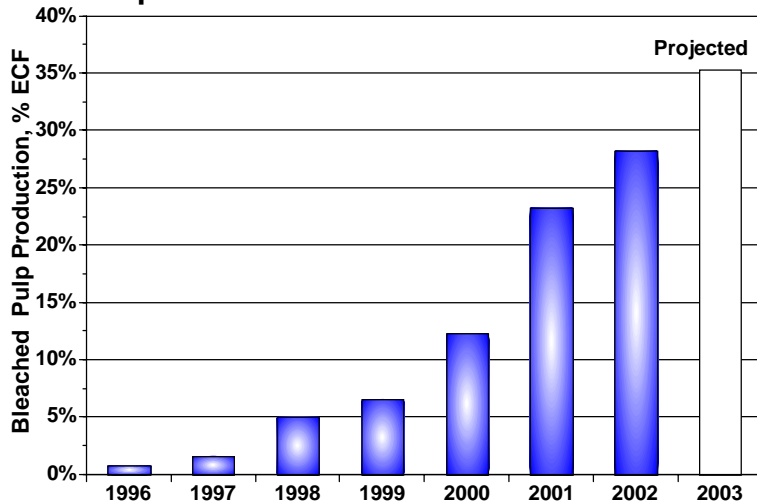
Scandinavian Bleached Chemical Pulp Production: 1990-2002



Japan

Japan produces approximately 8 million tonnes of bleached chemical pulp and began converting production to ECF in 1996. In 2002, an additional 400,000 tonnes was converted. ECF now represents over 25% of Japanese bleached chemical pulp production. Continued growth is expected in 2003, consistent with the commitment made by the major bleached pulp producers in Japan to eliminate chlorine, and in most cases, convert to ECF.

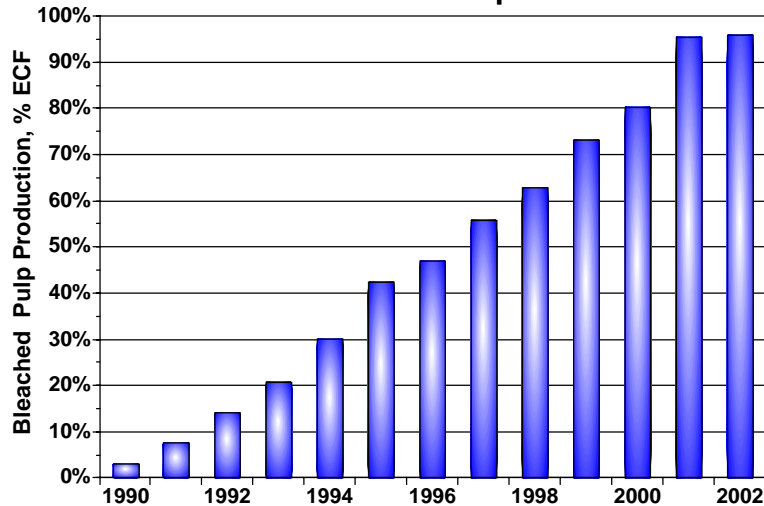
Japanese ECF Production: 1996-2003



North America

In North America, ECF production now represents over 95% of bleached chemical pulp production. The transition to ECF was essentially completed in 2001 as the balance of U.S. production came into compliance with the U.S. Environmental Protection Agency's Cluster Rule. The Cluster Rule is based, in part, on ECF as Best Available Technology (BAT) for bleached paper grade kraft and soda mills [2].

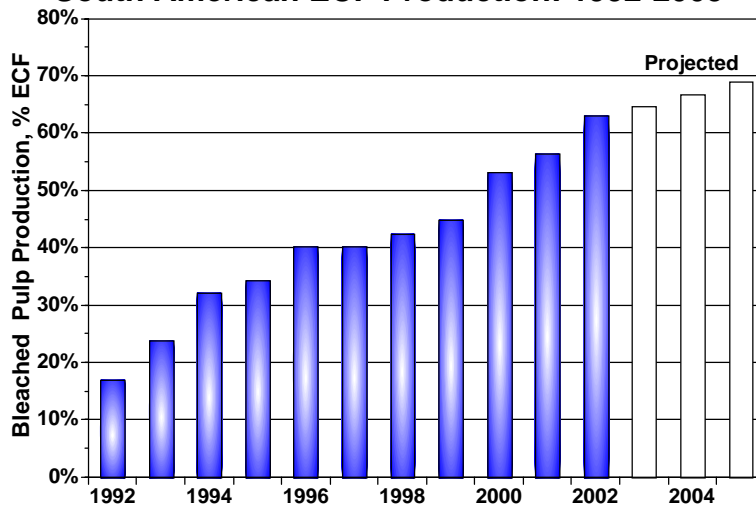
North America Bleached Chemical Pulp Production: 1990-2002



South America

In South America, ECF production is growing rapidly and in 2002 represented over 60% of bleached chemical pulp. The market share will increase dramatically over the next few years as more than 1.4 million tonnes of new ECF production comes on stream in Chile and Brazil [3,4].

South American ECF Production: 1992-2005



LOOKING AHEAD

Significantly, the European Community, in its Integrated Pollution Prevention and Control (IPPC) reference document, recently recognized ECF as a component of “Best Available Techniques” (BAT) [5]. In addition, a recent peer-reviewed investigation of the aquatic environmental impact of TCF and ECF-based bleaching reached the following conclusion [6].

“Studies comparing ECF and TCF effluents confirmed the absence of significant differences in biological effects in the aquatic environment“

- Institute for Papermaking, Darmstadt Technical University, Germany

Finally, with its acknowledged environmental compatibility, cost-competitiveness, and high quality desired by producers and users alike, ECF's market share can only continue to grow.

SOURCES

The Alliance for Environmental Technology, “Trends in World Bleached Chemical Pulp Production: 1990-2001,” May 2002.

2002 AET International Survey

REFERENCES

1. Rodden, G. *TCF Has Settled into It's Niche in the Market: It's a Mature Technology*. Pulp & Paper International. August 2003.
2. Federal Register, Vol. 63, No. 72. April 15, 1998.
3. Celulosa Arauco y Constitucion S.A. *Annual Report*, (2002).
4. Aracruz Celulose S.A. *Aracruz Inaugurates 3rd Pulp Line and Increases Production Capacity to 2 Million Tons*. News Release. August 8, 2002.
5. European Commission. *Integrated Pollution Prevention and Control (IPPC): Reference Document on Best Available Techniques in the Pulp and Paper Industry*. December 2001.
6. Hamm, U. and Göttshing, L. *ECF- and TCF Bleached Pulps: A Comparison of their Environmental Impact*. German Pulp and Paper Association VDP – INFOR project (No. 19), 2002.

APPENDIX (ALL DATA IN MILLIONS OF TONNES*)

WORLD

	ECF	TCF	OTHER**
1990	3.5	0.1	62.7
1991	8.2	0.4	58.2
1992	14.9	1.2	51.8
1993	20.0	2.6	46.8
1994	25.7	4.1	40.8
1995	31.2	4.7	36.8
1996	34.0	4.5	35.0
1997	39.0	5.0	34.4
1998	43.6	5.1	31.4
1999	48.8	5.0	24.1
2000	54.4	5.2	20.8
2001	63.7	4.5	14.9
2002	64.7	4.8	14.8

SCANDINAVIA

	ECF	TCF	OTHER
1990	2.3	0.1	6.5
1991	4.0	0.3	4.7
1992	6.6	0.6	2.0
1993	7.7	1.3	1.1
1994	8.5	2.2	0.0
1995	8.3	2.8	0.0
1996	7.6	2.6	0.0
1997	8.3	3.1	0.0
1998	8.8	3.2	0.0
1999	9.2	3.0	0.0
2000	9.2	3.0	0.0
2001	9.1	2.6	0.0
2002	9.0	2.5	0.0

NORTH AMERICA

	ECF	TCF	OTHER
1990	1.2	0.0	37.1
1991	3.0	0.0	35.3
1992	5.4	0.1	32.8
1993	7.9	0.2	30.0
1994	11.5	0.3	26.5
1995	16.4	0.3	22.0
1996	18.5	0.3	20.6
1997	22.0	0.3	17.2
1998	24.6	0.3	14.2
1999	28.6	0.3	10.2
2000	31.4	0.3	7.4
2001	36.3	0.1	1.6
2002	36.4	0.1	1.6

REST OF WORLD (Includes Eastern and Western Europe, Chile, Brazil, South East Asia, Africa, Australia, New Zealand, and Japan)

	ECF	TCF	OTHER
1990	0.1	0.0	19.1
1991	1.3	0.1	18.2
1992	2.9	0.6	17.0
1993	4.4	1.1	15.7
1994	5.8	1.6	14.3
1995	6.5	1.6	14.7
1996	7.9	1.8	14.4
1997	8.8	1.7	14.7
1998	10.2	1.6	14.9
1999	11.0	1.7	14.0
2000	13.9	2.0	13.3
2001	18.3	1.7	13.4
2002	19.3	2.1	13.0

* All data has been rounded to the nearest tenth

** Pulp bleached with some molecular chlorine