

HFOs---- Is There Enough Feedstock ?

The main new hydrofluoro-olefins (HFOs) may become difficult to obtain in the early 2020s, if the vital feedstock ---Carbon Tetrachloride (CTC)--- is not sufficiently available.

For years, CTC has been targetted: the feedstock enabling CFC11 and CFC12 production; an ODP higher than the CFCs; its seemingly endless use as a Process Agent; and “The Mystery of CTC”¹ --- why is more being found in the atmosphere than can be reliably accounted for from known anthropogenic sources? Quite understandably CTC is treated with suspicion, and has been heavily regulated wherever it is made or used.

Most of the common HFOs that are being or will be produced in the USA and Japan, and perhaps Europe, depend upon a process that involves the reaction of CTC with a hydrocarbon feedstock; the table below shows just how much

1 TON	NEEDS....
HFO1234yf	>2 tons CTC
HFO1234ze	>1.8 tons CTC
HFO1233zd	>1.4 tons CTC
HFO1224yd	-
HFO1336mzz	-
HFC245fa	>1.4 tons CTC

HFO1234yf² looks set to become the universally most accepted automotive air-conditioning fluid (MAC); its use is already enforced in new cars in the EU; and USA (2021) and Japan (2023) are set to follow with the use of HFC134a being prohibited in new cars. NSA foresees that by 2025, these three non-Article 5 areas will be using over 100,000 tons of HFO1234yf, equating to over 200,000 tons of CTC additional to that which is currently being used in feedstock applications. Between them, these three areas produce 30% of the world’s cars. Secondary Loop Systems may have been fully fleet-tested by 2025 but to date are not commercial on new vehicles. CO₂ has found a niche in powerful luxury cars.

HFO1234yf is also a component of new low-GWP refrigerant blends, such as R448A, R449A, R454A and R513A. This will add to the forecast consumption to MAC.

¹ http://www.sparc-climate.org/fileadmin/customer/6_Publications/SPARC_reports_PDF/SPARC_ReportNo7_CCI4.pdf

² HFO1234yf has been only supplied from China(mainly), Japan or USA until mid-2017. There is also a small plant with this process in India. The multi-stage and more expensive process is based upon HCFC22, not CTC. A new larger CTC-based plant came on-stream in the US in 2H2017 and a second is due 2H2018, also in the US.

The manufacturing plants for HFO 1233zd and HFO1234ze (and HFC245fa) are very different from those making HFO1234yf. They have both been promoted as foaming agents for insulation purposes, but more importantly for refrigeration and chiller applications. In some applications, HFO1233zd may be used alone whilst HFO1234ze features in refrigerant blend series such as R448-, R460-, and in R515A. NSA forecasts that, by 2025, consumption of CTC for these two products will be over 50,000 additional tons of CTC.

Substitution of the insulation foaming agent HFC245fa and HFC365mfc is part of the reduction regulations in force in EU, USA, and Japan, and in these areas its use, and that of CTC as its feedstock, will be largely reduced to zero by 2023. However, in China, new HFC245fa capacity has been and continues to be built. This is due to the decline in use of HCFC141b as a consequence of the Chinese HPMP³ strategy.

The outlook for CTC of NSA Ltd and Tecnon OrbiChem is tabulated below.

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
CTC Demand	170	183	222	243	271	304	345	373	443	472	491
CTC YoY increase	OK	13	38	21	28	33	41	28	70	29	19
Cumulative Increase from 2015		13	56	77	105	138	179	207	277	306	325

The CTC demand line represents its current and anticipated annual volume of use as a chemical intermediate: the cumulative increase in demand for CTC is predicted, on a business-as-usual scenario, to become close to capacity in 2019 and to exceed it by 2022 and onwards, leading to potential supply disruptions with attendant pricing issues.

We expect a continuing debate on the efficacy, safety, cost-effectiveness, and energy efficiency of the HFOs, comparing all these elements with their hydrocarbon, ammonia, and CO₂ alternatives. The full study “Carbon Tetrachloride 2016-2025: Long, Balanced or Tightening? The Impact of HFOs” by NSA Ltd and Tecnon OrbiChem was issued on 1st June 2018 and is confidential to subscribers. Market sectors such as MAC, RAC, and insulation are examined in depth.

To order this study please go to https://www.orbichem.com/Carbon_Tetrachloride.aspx and fill in the order form electronically.

Technical enquiries only should be sent to info@nolansherry.com

³ HPMP = HCFC Phase-out Management Plan