



## Major Milestones in the Development of HFO-1234yf

From the Kyoto-Protokoll to the MAC-directive – the development of HFO-1234yf is tied closely to the history of climate protection:

Date	Milestones
16 September 1987	The signatory states of the UN sign the "Montreal Protocol". It aims to prevent emissions that harm the earth's ozone layer.
1 January 1989	The "Montreal Protocol" comes into effect.
11 December 1997	The signatory states of the UN adopt the "Kyoto-Protocol". The industrial nations commit themselves to reduce emissions of greenhouse gases until 2012 by 5.2 percent below 1990's level.
8 March 2000	The EU-Commission's European Climate Change Program intensifies the efforts to implement the "Kyoto-Protocol". Working groups discuss options, motor vehicle air conditioning comes into focus.
10 October 2000	The EU Environment Council requests from the EU-Commission to consider measures to reduce emissions of F-Gases (fluorinated greenhouse gases) in motor vehicle air conditioning.
2003	The European Commission approves HFC-152a, R744 and other refrigerants as possible new refrigerants for motor vehicle air conditioning.
16 February 2006	Honeywell presents new, climate-friendly refrigerants.
17 May 2006	The EU-directive on air conditioning systems in motor vehicles (2006/40/EG, "MAC-directive") imposes strict requirements on refrigerants applied. Only refrigerants with a Global Warming Potential (GWP) of less than 150 will be approved for use in mobile systems.
4 July 2006	The EU F-Gas regulation (EU regulation no. 842/2006) and the MAC-directive of the European Parliament and Council on emissions of F-Gases in motor vehicle air conditioning and on amending directive 70/156/EWG come into effect.
14 February 2007	Honeywell and DuPont introduce new refrigerants with low GWP at the annual "Alternative Refrigerant Winter Meeting" of the German Association of the Automotive Industry (VDA).
13 February 2008	Honeywell and DuPont present the new and market-ready HFO-1234yf at the annual VDA "Alternative Refrigerant Winter Meeting".

1 December 2008	The registration process of HFO-1234yf for REACH begins. REACH, the new EU chemicals regulation, requires that chemical substances on their own and in preparations have to be registered to the European Chemicals Agency (ECHA).
8 December 2008	Honeywell's low-global-warming-potential refrigerant HFO-1234yf is endorsed by the renowned SAE's (International Society of Automobile Engineers) International Cooperative Research Program for use in vehicles: "HFO-1234yf offers greatest potential to meet environmental and consumer needs"
1 January 2009	After intensive testing of R744, SAE's International Cooperative Research Program prioritizes HFO-1234yf over R744 as refrigerant for practical use in vehicles.
28 May 2009	The German Association of the Automotive Industry (VDA) demands a global standard for refrigerants.
4 August 2009	HFO-1234yf is intensively tested by the Japanese Ministries of Health, Labour and Welfare, Economy, Trade and Industry and of the Environment and approved for practical use.
13 October 2009	The US-Environmental Protection Agency (EPA) accepts HFO-1234yf in its SNAP-program for use as low GWP-refrigerant in motor vehicle air conditioning.
5 January 2010	The European Patent Office grants Honeywell the patent for the new low-GWP refrigerant HFO-1234yf for motor vehicle air conditioning.
20 May 2010	Honeywell and Dupont announce a Joint Venture to manufacture the new low-GWP refrigerant HFO-1234yf.
23 July 2010	GM chooses to use HFO-1234yf in cars of its U.S. brands Cadillac, Chevrolet, Buick and GMC from 2013 on.
28 February 2011	EPA approves HFO-1234yf for use in motor vehicle air conditioning. EPA's SNAP report criticizes the tests conducted by the German Bundesanstalt für Materialforschung und -prüfung BAM (Federal Institute for Materials Research and Testing) for not fully revealing the test set-up. Thus, tests cannot really be judged scientifically, EPA notes.