

Paris Session 2022



Expected end of life of HVCR® core

Study Committee B2 Overhead Lines

PS2 – Question 2.9

“Based on the thermal ageing data what is the expected life (in years) of an ACCC conductor at 160 C operating temperature? What is the expected end of life (in years) of ACCC at 180 C ?”

Baptiste Gary - FRANCE

EPSILON COMPOSITE CABLE

The alternative

Question clarification

ACCC® is a brand and not a conductor type.

CIGRE Technical Brochure 695 mention TYPE 4 :
Conductors with Polymer Matrix Composite core

This contribution is about expected end of life of :

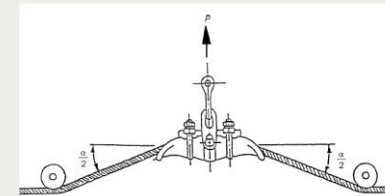
HVCRC® core



Group Discussion Meeting

Type	Core	Envelope	Acronym or trademark	Description
0	Galvanized or aluminium clad steel	Hard drawn aluminium and aluminium alloys	ASC, AAC, AASC, AAAC, ACSR, AACSR, ACAR, etc.	Operating at temperature not exceeding 95°C
1	Galvanized, mischmetal or aluminium clad steel	Thermal aluminium AT1 (TAL or 60TAL)	TACSR	Thermal resistant aluminium alloy conductor, steel reinforced
	Invar steel	Thermal aluminium AT1 (TAL or 60TAL)	TACIR	Thermal resistant aluminium alloy conductor, invar reinforced
	Galvanized, mischmetal or aluminium clad steel	Thermal aluminium AT2 (KTAL)	KTACSR	High strength, thermal resistant aluminium alloy conductor, steel reinforced
	Galvanized or mischmetal clad steel	Thermal aluminium AT3 (ZTAL or UTAL)	GZTACSR	Gap type, ultra thermal resistant aluminium alloy conductor, steel reinforced
	Galvanized, mischmetal or aluminium clad steel	Thermal aluminium AT3 (ZTAL or UTAL)	ZTACSR	Ultra thermal resistant aluminium alloy conductor, steel reinforced
	Invar steel or aluminium clad invar steel	Thermal aluminium AT3 (ZTAL or UTAL)	ZTACIR, ZTACIR/HACIN	Ultra thermal resistant aluminium alloy conductor, invar reinforced
	Invar steel or aluminium clad invar steel	Thermal aluminium AT4 (XTAL)	XTACIR, XTACIR/HACIN	Extra thermal resistant aluminium alloy conductor, invar reinforced
2	Galvanized, mischmetal or aluminium clad steel	Annealed aluminium 1350-0	ACSS	Aluminium conductor, steel supported
3	Metal matrix composite	Thermal aluminium AT3 (ZTAL or UTAL)	ACCR, ACMR	Thermal-resistant aluminium alloy conductor, metal matrix composite core reinforced
4	Polymer matrix composite	Thermal aluminium AT1 (TAL or 60TAL)	ACPR	Thermal-resistant aluminium alloy conductor, polymer matrix composite core reinforced
		Thermal aluminium AT3 (ZTAL or UTAL)	ACCFR, ACFR, ACPR	Thermal-resistant aluminium alloy conductor, polymer matrix composite core reinforced
		Annealed aluminium 1350-0	ACCC, ACPS, ACCFR, ACFR, CRAC, HVCRC, C'	Annealed aluminium conductor, polymer matrix composite core supported

1 - End of life criteria definition



1. Tensile properties

Ensure that tensile properties are guaranteed

Tensile criteria (ASTM B987-20):
 $UTS > 95\% \text{ RTS}$

(RTS for HVCRC® is 2250 MPa)

2. Matrix properties

Ensure that transverse load will be held correctly

Matrix criteria (ASTM B987-20):
 $T_g > \text{Emergency } T^\circ + 5^\circ\text{C}$

(Emergency T° for HVCRC® is 180°C)



According to the end of life criteria, expected end of life can vary a lot !

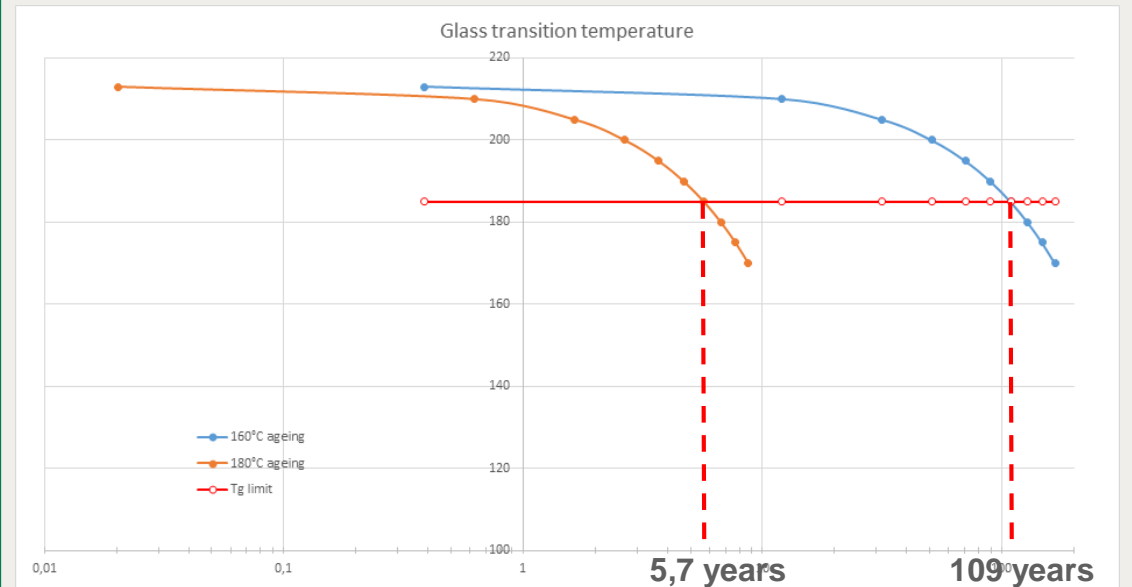
2 – Losses extrapolation

1. Tensile properties

Tensile test after ageing will be finished soon

Results to be published in a future paper

2. Matrix properties



Tg end of life criteria is often more conservative than tensile

Group Discussion Meeting

3 – Excepted end of life for HVCR® core

“Based on the thermal ageing data what is the expected life (in years) of an ACCC conductor at 160 C operating temperature?”

109 years

(31 years if end of life criteria is $T_g > 205^\circ$)

“What is the expected end of life (in years) of ACCC at 180 C ?”

5.7 years

(1.6 years if end of life criteria is $T_g > 205^\circ$)

**According to the end of life criteria, expected end of life can vary a lot.
It needs a clear agreement between suppliers and utilities.**