FIGURES

Fig 1. Coated Tool

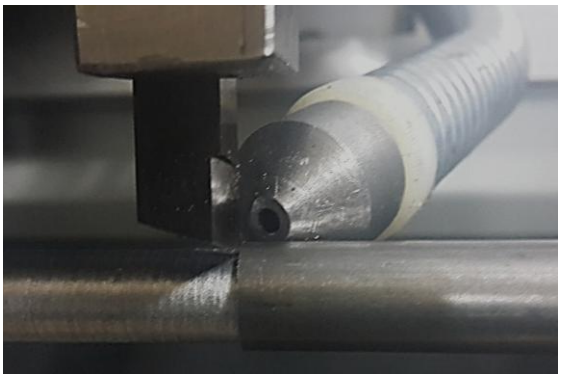

Fig 2. Temperature Measurement System

Fig 3. Machined Steel Samples

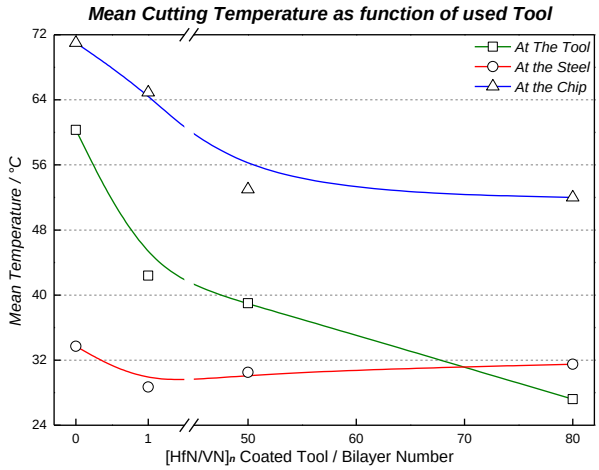

Fig 4. Mean Temperature

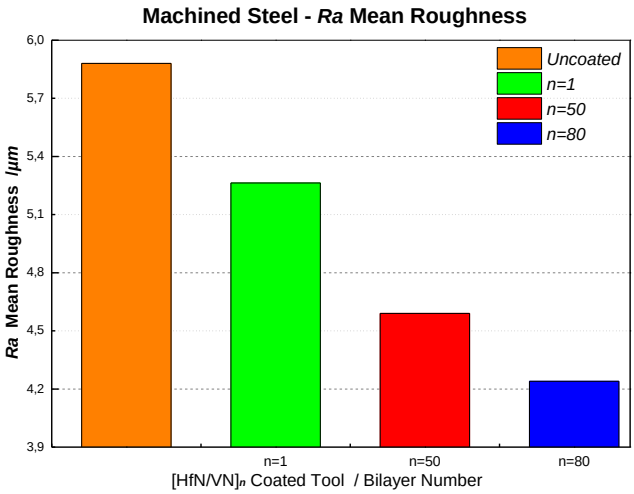

Fig 5. *Ra* Mean Rouhgness

References

M. A. Davies, T. Ueda, R. M'Saoubi, B. Mullany, & a. L. Cooke, "*On The Measurement of Temperature in Material Removal Processes*," CIRP Ann. - Manuf. Technol., vol. 56, no. 2, pp. 581–604, 2007.

C. Morant, D. Cáceres, J. M. Sanz, & E. Elizalde, "*Nano-mechanical properties of BCN/CN/BN multilayer films*" Diam. Relat. Mater., vol. 16, no. 4, pp. 1441–1444, 2007.

H. E. Jaramillo, G. Zambrano, & P. Prieto, "*Síntesis Y Caracterización De Recubrimientos Y Multicapas Sobre Acero AISI 4340 Para Aplicaciones*," in Congreso CONAMET/SAM 2004, 2004, No. 1.

D. Manivel, R. Gandhinathan, "*Optimization of surface roughness and tool wear in hard turning of austempered ductile iron (grade 3) using Taguchi method*", Measurement, vol. 93, , pp. 108-116, 2016.

C. A. Escobar Claros & M. S. Villarreal Montenegro, "*Obtención Y Caracterización De Recubrimientos De HfN, VN Y HfN/VN Para Su Aplicación En La Industria Metalmecánica*." Universidad del Valle, 2011.

C. Escobar, M. Villarreal, J. C. Caicedo, W. Aperador, & P. Prieto, "*Novel performance in physical and corrosion resistance HfN/VN coating system*," Surf. Coatings Technol., vol. 221, pp. 182–190, Apr. 2013.

C. Escobar, J. C. Caicedo, W. Aperador, A. Delgado, & P. Prieto, "Improve on Corrosion Resistant Surface for AISI 4140 Steel Coated with VN and HfN Single Layer Films," Int. J. Electrochem. Sci., vol. 8, no. 6, pp. 7591–7607, 2013.

C. Escobar, M. S. Villarreal Montenegro, J. C. Caicedo, W. Aperador, & P. Prieto, "*Tribological and wear behavior of HfN/VN nanomultilayer coated cutting tools*," Ing. e Investig., vol. 34, no. 1, pp. 22–28, Mar. 2014.

C. A. Escobar, J. C. Caicedo, & W. Aperador, "Corrosion resistant surface for vanadium nitride and hafnium nitride layers as function of grain size," J. Phys. Chem. Solids, vol. 75, no. 1, pp. 23–30, Jan. 2014.

C. Escobar, H. H. Caicedo, & J. C. Caicedo, "*Hafnium and vanadium nitride heterostrutures applied to machining devices*", Int. J. Adv. Manuf. Technol., vol. 82, no. 1–4, pp. 369–378, 2016.

Mora Parada, "*Propiedades Tribocorrosivas De Monocapas De HfN, VN Y Multicapas [HfN/VN]n depositadas sobre acero AISI 4140*", UPTC, 2014.

J. C. Caicedo, G. Zambrano, W. Aperador, L. Escobar-Alarcon, & E. Camps, "*Mechanical and electrochemical characterization of vanadium nitride (VN) thin films*," Appl. Surf. Sci., vol. 258, no. 1, pp. 312–320, Oct. 2011.

J. C. Caicedo, M. Mozafari, & W. Aperador, *"Determination of superlattice effect on metal–ceramic nano-structures*," Results Phys., vol. 5, pp. 241–249, 2015.

W. Aperador, A. Delgado, & J. H. Bautista Ruiz, "*Assessment of Tribocorrosion Behaviour of Steel 316 LVM Coated with HfN and HfN / Hf*.", Int. J. Electrochem. Sci., vol. 10, no. 9, pp. 9408–9416, 2015.

M. Mora, W. Aperador, E. Vera, & C. A. Amaya Hoyos, "*Comportamiento Tribocorrosivo Del Acero AISI 4140 Recubierto Con Monocapas De HfN*," Rev. Colomb. Mater., vol. 5, pp. 19–25, 2013.

A. Posso, L. Yate, J. C. Caicedo, L. Ipaz, S. Romero, L. Escobar Alarcón, E. Camps, & G. Zambrano, "*Caracterización de Películas Delgadas de Nitruro de Vanadio (VN) Depositadas por Magnetrón Sputtering D.C,"* Rev. la Soc. Colomb. Física, vol. 41, no. 1, pp. 17–19, 2009.

M. H. Staia, D. G. Bhat, E. S. Puchi-Cabrera, & J. Bost, "*Characterization of chemical vapor deposited HfN multilayer coatings on cemented carbide cutting tools*," *Wear*, vol. 261, no. 5–6, pp. 540–548, Sep. 2006

S. Kalpakjian & S. R. Schmid, "*Manufacturing engineering and technology*," in, 7th ed., New York: Prentice Hall, 2014.

M. A. El Hakim, M. A. Shalaby, S. C. Veldhuis, & G. K. Dosbaeva, "*Effect of secondary hardening on cutting forces, cutting temperature, and tool wear in hard turning of high alloy tool steels*," *Measurement*, vol. 65, pp. 233–238, Apr. 2015.

J. H. Navarro-Devia, W. A. Aperador, and A. Delgado, "*Evaluación del Desempeño de Buriles con Recubrimiento Monocapas de Nitruro de Hafnio en el Proceso de Mecanizado*" Inf. Tecnológica, vol. 27, no. 1, pp. 127–138, 2016.