

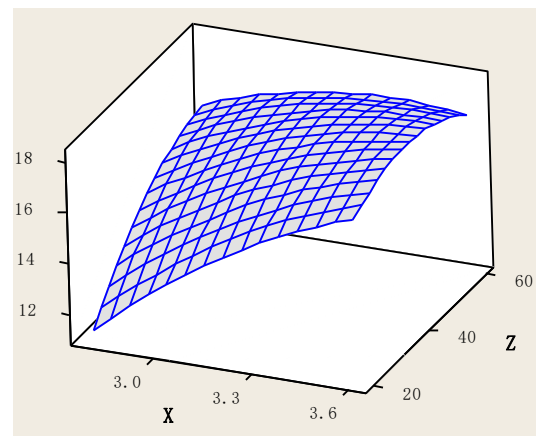
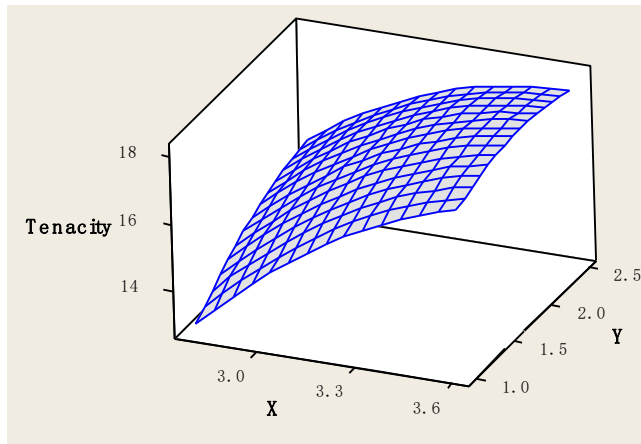
Appendix

Table A1 Coded and actual level for each variables of the CCD

Variables	Code	Variation levels				
		-1.682	-1	0	+1	+1.682
Twist factor	X	2.8	2.96	3.2	3.44	3.6
Speed ratio	Y	0.99	1.3	1.75	2.2	2.51
Wrap angle (o)	Z	19.82	28	45	52	60.18

Table A2 Fitted equations of Ne 40 yarns in coded values

Yarn properties	Response surface equations	R ²
Tenacity	$16.9354 + 1.0856X + 0.3558Y + 0.6229Z - 0.2456X^2 - 0.1519Y^2 - 0.3463Z^2 - 0.1713XY - 0.4237XZ - 0.0738YZ$	0.949
Evenness	$13.0241 - 0.0283X - 0.0597Y + 0.1781Z + 0.0536X^2 + 0.0412Y^2 + 0.0288Z^2 + 0.0675XY + 0.0725XZ + 0.035YZ$	0.757
Thin places (-40%)	$127.528 + 1.238X - 2.796Y + 28.41Z + 7.804X^2 + 3.915Y^2 + 8.157Z^2 + 6.75XY + 5.75XZ + 10.5YZ$	0.836
Thick places (+50%)	$26.5947 - 1.3679X - 2.2533Y + 2.6993Z + 3.5933X^2 + 2.1791Y^2 + 1.1184Z^2 + 3.125XY + 0.375XZ - 0.375YZ$	0.712
Neps (+140%)	$306.359 - 69.815X - 3.574Y - 11.366Z + 43.745X^2 + 27.835Y^2 + 24.476Z^2 - 5.625XY + 9.125XZ - 16.625YZ$	0.614
Hairiness (S3)	$497.46 - 185.53X - 96.52Y - 326.63Z + 56.17X^2 + 75.79Y^2 + 162.59Z^2 + 33.62XY + 91.12XZ + 66.13YZ$	0.946



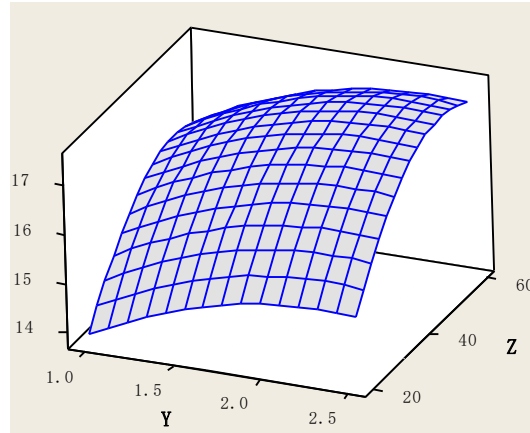


Figure A1 Effects of three factors on yarn mean tenacity

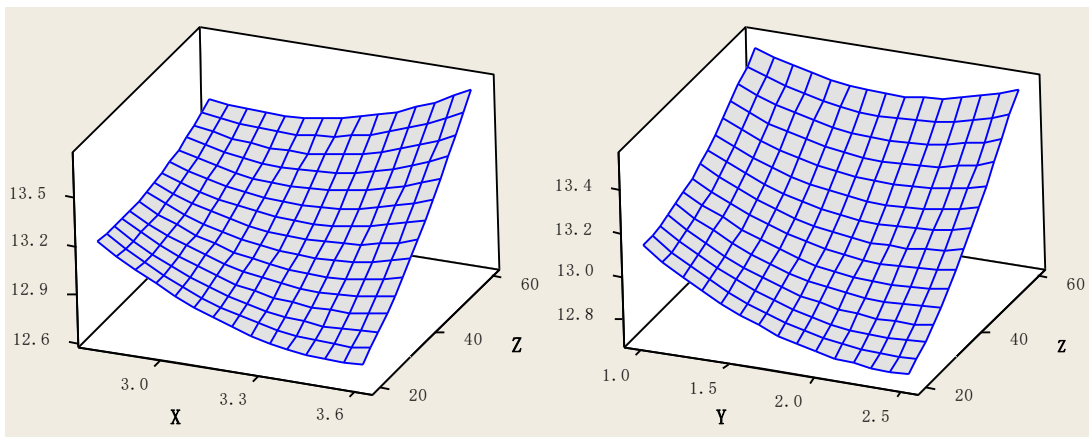
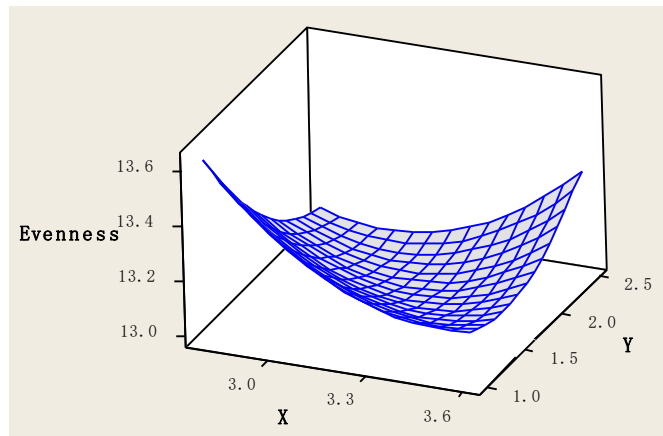


Figure A2 Effects of three factors on yarn evenness

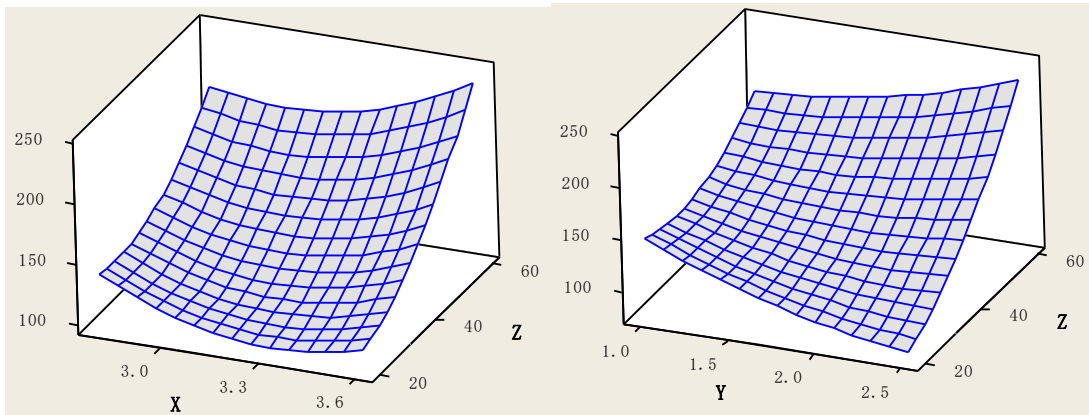
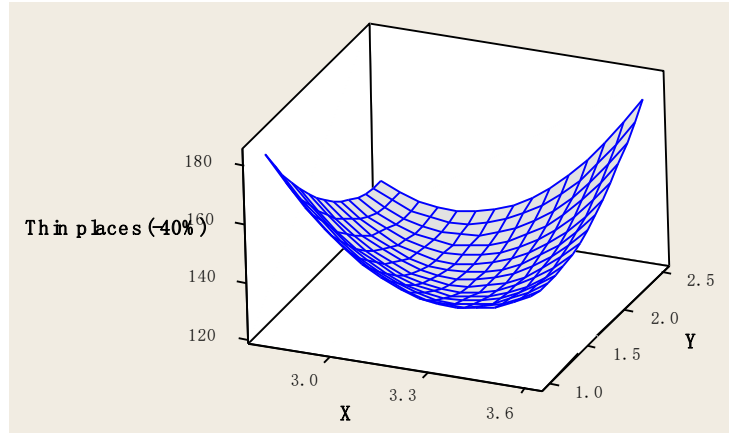
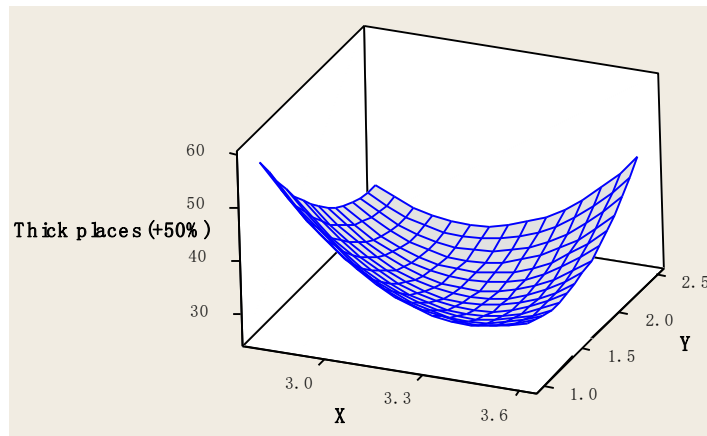


Figure A3 Effects of three factors on thin places (-40%)



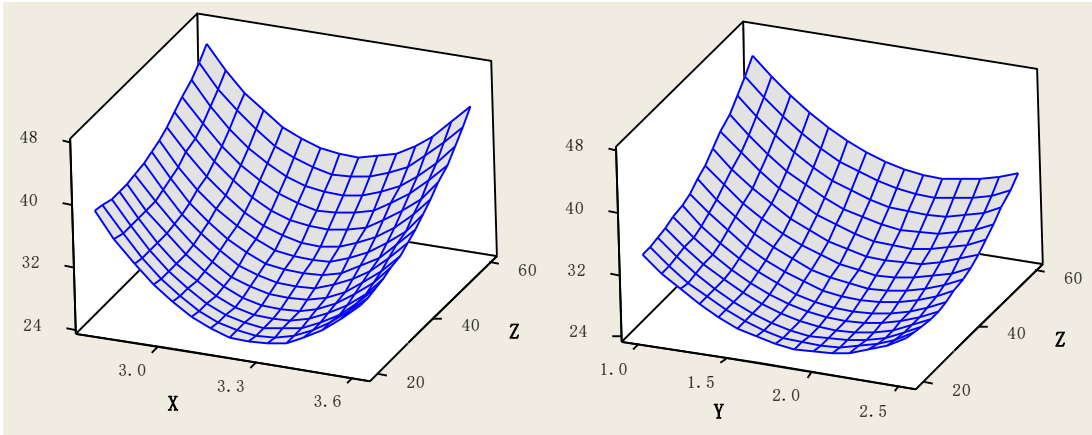


Figure A4 Effects of three factors on thick places (+50%)

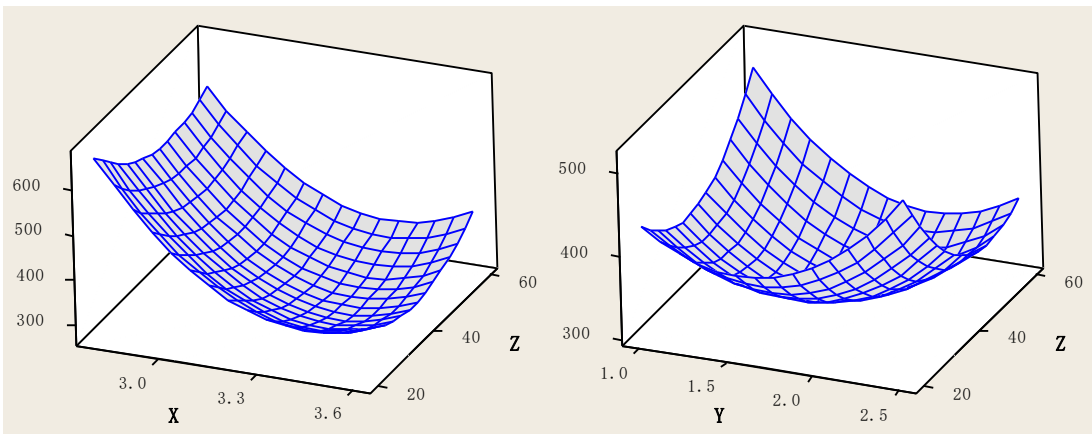
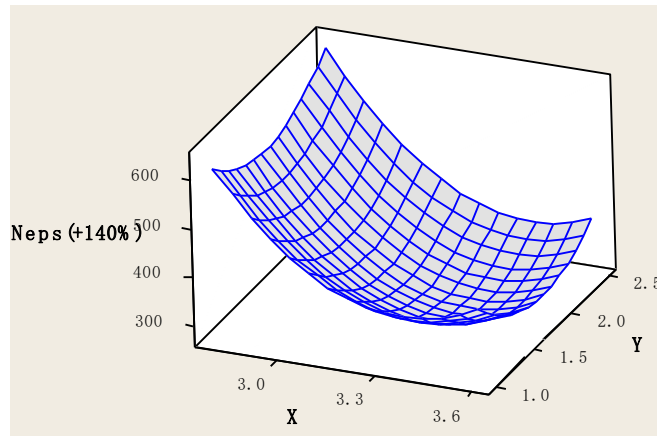


Figure A5 Effects of three factors on neps (+140%)

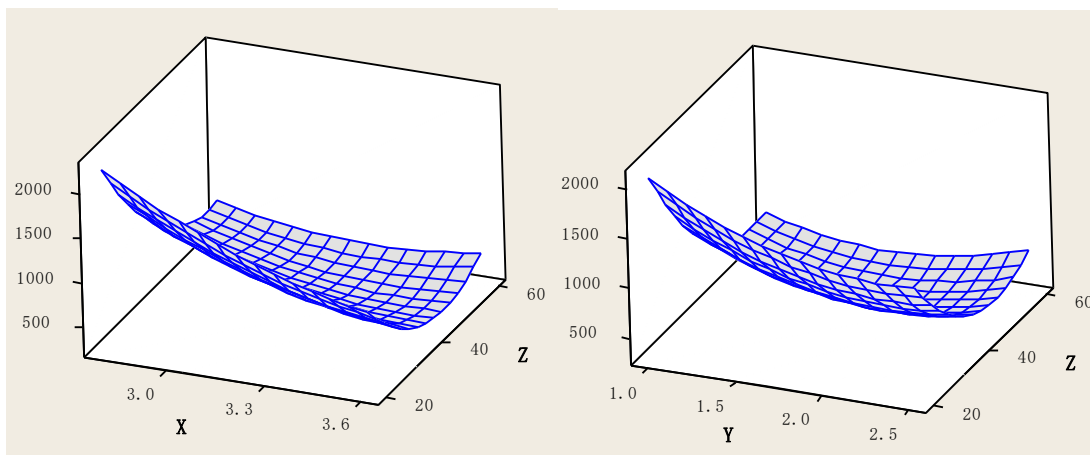
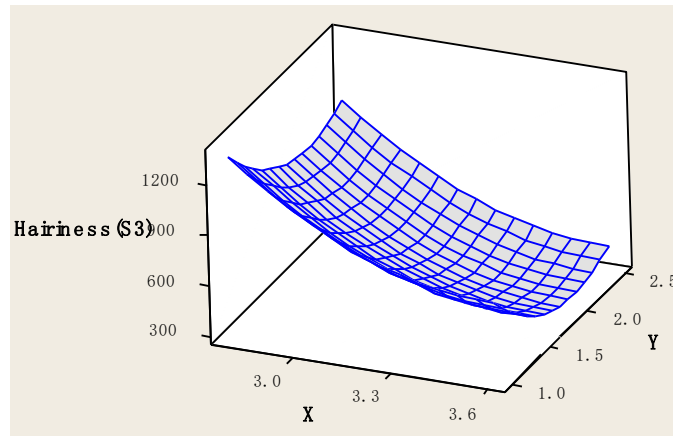


Figure A6 Effects of three factors on hairiness (S3)