Hop wire-works in Czech Republic

J. Kořen - 1, V. Ciniburk - 2, M. Eliášová - 3

T. Vraný - 4, J. Gregorik - 5

1, 2 - J. Kořen, V. Ciniburk, Hop Research Institute, Co., Ltd., Žatec, Czech Republic
3, 4 - M. Eliášová, T. Vraný, Faculty of Civil Engineering, ČVÚT Prague, Czech Republic
5 - J. Gregorik, Chmelařství – cooperative, Žatec, Czech Republic
e-mail: jiri.koren@telecom.cz

Growing yields of hops in new Czech varieties under existing types of wire-works with traditional wire elements increase requirements on maintenance and repair works are more often. In this way the risk of their breakdown becomes real. A new type of wirework brings about higher stability under the yield of hops on the level of 3 t/ha. The costs keep on the same level even though quality is higher.

Construction of the wirework

Wirework after construction

Measurement of forces in the wirework

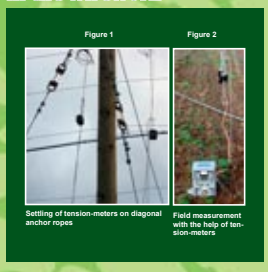


Figure 1

Settling of tension-meters on diagonal anchor ropes

Figure 2

Field measurement with the help of tension-meters

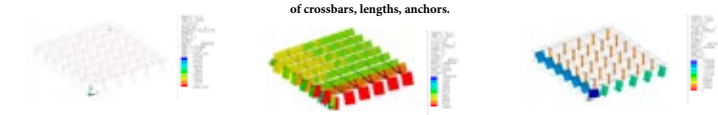
The following activities are included into the project:

- determination of data for carrying capacity of a wirework
- proposal of a wirework
- statistical calculation
- construction of an experimental wirework
- measurement of forces in anchorage rods
- design of a numeric model as well as testing of its characters
- economical assessment.

Arrangement of the wirework

Plant spacing:	3 x 1 m
Pole spacing:	9 x 8 m
Number of plants per hectare:	3334 pcs
Type of plants' training:	1 plant/2 wires/4bines
Average weight per one wire:	6 kg
Hop variety:	Premiant
Planned loading by the weight of hop bines:	40 N/m2

Load state before harvest - normal forces (N) of crossbars, lengths, anchors.



Axonometric view of the experimental wirework

Load state before harvest – normal forces (N) - poles

Designed and statically tested material profiles

Material	Dimensions
Plot supporting rope	Steel cable 3x2mm
Diagonal supporting rope	Steel cable 19x1,6 mm (1+6+12)
Lengthwise rope	Steel cable 7x2 mm (1+6)
Anchor rods of crossbars	Steel cable 19x1,6 mm (1+6+12)
Anchor rods of lengths	Steel cable 7x2 mm (1+6)
Inner pole	Wooden pole 120/150 mm
Frame pole	Wooden pole 155/170 mm
Corner pole	Wooden pole 170/210 mm

Durability of the cable = 1270 MPa

Space bar-shaped model of the wirework in ANSYS program.
The model was designed as a geometric nonlinear. Severe deformations have been taken into account. Resilience plastic parameters of soil were lead in supports of the poles. Prestress was used in cable elements.

Wirework after training hop bines on wires in the first vegetation year

Wirework shortly before harvest in the first vegetation year

The wirework was not fully loaded by vigorous hop plants in the first vegetation year. Nevertheless, deformation of soil under poles was obvious. Therefore the wirework had to be fastened after harvest. In 2007 measurements of forces in anchor connecting rods were repeated.

Acknowledgement
The work was supported by the Czech Ministry of Industry and Commerce, within the project no. FI-IM2/180.

Hop Research Institute Co., Ltd., Saaz, Czech Republic www.chizatec.cz