Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 121-132
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

Discussion on the Application of Guan Lide in the Teaching of Water supply Network Design from the Perspective of Educational Psychology

Rusheng Jia*, Jie Yang, Xinwei Song, Wanfeng Wan, Yulan Gao
College of architecture and civil engineering, West Anhui University, Lu'an, Anhui, China
*Corresponding Author.

Abstract:

Water supply network design is an important part of the practical teaching of water supply and drainage science and engineering. Through water supply network design, students can cultivate their preliminary ability to independently write design instructions and draw design drawings. At the same time, it is of great significance for students to establish correct engineering moral quality. At present, many colleges and universities adopt epaneth in the course design of water supply pipe network. Although the interface is relatively simple, it mainly depends on manual drawing of pipe network and input data. The labor intensity is relatively high, the result expression is not rich enough, and there is no drawing function. It needs to be combined with other software to give full play to its advantages, Guan Lide is a series of pipeline design software developed on the basis of Hongye municipal pipeline software. It has the advantages of topographic map identification, pipeline plane intelligent design, vertical visual design, automatic marking, automatic table drawing and automatic drawing. It is widely used in design institutes and other units. In order to improve the employment competitiveness of graduates, It is necessary and urgent to master a piece of professional software. Therefore, starting from the significance of educational psychology to the design of water supply network system, combined with the current professional specifications, taking a county in Hunan as an example, it introduces in detail the input and processing of basic information, pipeline layout, hydraulic calculation of pipe network, selection of water pump, fire protection, accident verification and so on, It is concluded that firstly, the pipeline layout of the pipe erection software can be directly carried out on the CAD base map without drawing the pipeline map separately. Moreover, there are fewer manual calculations than EPANETH. Only the node flow can be calculated, and the software can automatically distribute the flow. In addition, the hydraulic calculation of the water supply network is mainly carried out by the inverse method starting from the control point, and the changes of the water pressure and flow of the pipe network are clear at a glance, Finally, the appropriate pump can be directly selected according to the node parameters of the back calculation water source pressure adjustment calculation, which is very convenient and reliable. When checking the fire accident, it can quickly meet the requirements by changing the pipe diameter in the table. In short, Guan Lide software is a more professional software with convenient operation, and has more advantages in the preliminary design of water supply network, However, when carrying out multi pipeline design or construction drawing design, it needs to master a lot of professional knowledge and operation skills, and further study is needed to be able to apply flexibly.

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 121-132
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

Keywords*: Guan lide, Water supply network design, Teaching, Educational psychology.*

I. INTRODUCTION

Educational psychology is a science that studies the psychological phenomena and laws in the process of education. It includes various psychological phenomena of the educated and the laws of their change and development, as well as how educators can effectively educate the educated through these laws. As a discipline guiding educational practice, educational psychology has very distinct practicality and applicability. In the teaching of water supply network system design, in order to teach this course well, many teachers have summarized a lot of excellent teaching experience and teaching methods with their many years of teaching efforts and long-term self exploration, but the essence of these experience and methods is inseparable from students' learning psychological activities. Educational psychology reveals the laws of learning psychological activities and teaching activities. Any educational measures in higher education are based on these laws. If teachers can use the knowledge of educational psychology to guide the actual teaching at all stages of teaching, grasp the characteristics of students' psychological activities, and timely adjust the teaching methods and means, it is bound to be of great significance to improve the teaching quality of water supply network design and promote the in-depth development of teaching reform.

Water supply network system design is an important part of the practical teaching of water supply and drainage science and engineering. Through water supply network system design, students can understand and be familiar with the general principles, methods and steps of water supply network system design and relevant new technologies and equipment, so as to cultivate students' preliminary ability to independently prepare design instructions and draw design drawings, At the same time, it is of great significance for students to establish correct engineering moral quality. In the teaching process, some instructors require all manual calculations to limit the use of software. In this way, there will be some problems, such as difficult error correction, large workload when the pipe network is complex and there are many pipes, it is difficult to complete the design within the specified time, and the final "result map" can only be the "result map" of the first adjustment. Some students' learning enthusiasm has been hit. Facing the new learning needs, they are unable to reconstruct new knowledge from the existing cognitive structure, resulting in learning difficulties and even weariness. Therefore, in order to achieve "three complete education", the design of water supply network should not only adopt manual calculation, but should be combined with relevant software for teaching. At present, many pipe network designs use EPANET to conduct hydraulic simulation of pressurized pipeline system. Although EPANET can execute large multi-source complex pipe network with tens of thousands or more nodes, due to its simple interface, it mainly relies on manual drawing of pipe network and input data, with high labor intensity, insufficient result expression and no drawing function. It is often only used as the calculation core of the model and needs to be combined with other software to give full play to its advantages [1]. Therefore, for the majority of students majoring in water supply and drainage science and engineering, in course design It is very important and urgent to select and skillfully apply a simple and powerful pipe network design software in practical teaching such as graduation design.

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 121-132
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

II. INTRODUCTION TO HONGYE GUANLIDE

Hongye 3D intelligent pipeline design system (Guan Lide) is a series of pipeline design software developed on the basis of Hongye municipal pipeline software, including water supply and drainage pipeline design, gas pipeline design, thermal pipe network design, power pipeline design, telecommunication pipeline design, pipeline comprehensive design, etc. it can identify topographic map, pipeline plane intelligent design, vertical visual design, automatic annotation and automatic table drawing And automatic mapping, the application has attracted more and more attention [2].

III. APPLICATION OF HONGYE PIPE STAND IN TEACHING OF WATER SUPPLY NETWORK DESIGN

3.1 Input and Processing of Basic Information

3.1.1 Design background data of a county

The county is located in the east of Hunan, close to the Xiangjiang River. It is a type I small city and is located in zone 1. The short-term planning period is 5 years and the population is 250000. There are only two industrial enterprises with large water consumption in the city. The water consumption of industrial enterprise 1 is $3900m^3.\ d^{-1}$ and that of industrial enterprise 2 is $4400m^3.d^{-1}$. the two enterprises have no special requirements for water quality, the water pressure is not less than 24m, and the daily water consumption of railway stations is $2300m^3.d^{-1}$, which is considered as uniform water consumption.

TABLE I. Maximum daily water consumption in each period (%)

Time /h	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8
Water /%	1.6	1.47	1.43	2.36	2.36	4.15	5.14	6.03
Time /h	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16
Water /%	5.59	5.2	5.07	5.35	5.35	5.35	5.27	5.52
Time /h	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24
Water /%	5.75	5.96	5.72	5.00	3.19	2.69	2.58	1.87

3.1.2 Design total water supply and minimum water supply pressure

According to the design water supply specified in the design standard for outdoor water supply [3], the design water supply includes comprehensive domestic water, water for industrial enterprises, water for sprinkling municipal, square and green space, water leakage of pipe network, unforeseen water consumption and fire water. According to the principle of combining short-term and long-term and focusing on the short-term, the maximum daily design water consumption of the county in the near future

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 121-132
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

is 93841m³/ d (the fire water consumption is not accumulated into the total design water consumption and is only used for verification), and then according to Table I, the hourly variation coefficient K_h is 1.446, and the maximum daily hourly water consumption Q_h is 1571.920 L/s. according to the background data, the minimum water supply pressure (control point) is considered as 24mH_2O.

3.1.3 Pipeline layout

Layout requirements of water supply network [4]. The pipe network shall be arranged according to the urban planning plan, and the possibility of phased construction of variable frequency water supply equipment system shall be considered in the layout. The layout of pipe network must ensure the safety and reliability of water supply. In case of accidents in local pipe network, the water cut-off range shall be minimized. Pipelines are distributed throughout the water supply service area to ensure that users can obtain sufficient water volume and water pressure. Strive to lay pipelines with the shortest distance to reduce the cost of pipe network and water supply energy consumption.

According to the topographic map, the relevant information can be obtained directly, and the interactive pipe laying or direct pipe laying can also be adopted manually. The manual interactive pipe laying is adopted in this county.

IV. COURSE DESIGN CONTENT OF WATER SUPPLY PIPE NETWORK SYSTEM

The design of water supply network system includes specific flow calculation, flow calculation along the line, node flow calculation, pipe section design flow calculation, pipe diameter calculation, hydraulic calculation of pipe network system, pump head calculation and optimization calculation of water supply network system [5].

4.1 Specific Flow, Flow Along the Line and Node Flow

The length specific flow q_s of the project is introduced, and the water distribution is shown in Table II, q_s=(1571-122.69)/22820.77=0.0635L/(s.m), the flow along the line and node flow of each pipe section can be calculated, as shown in Table III and Table IV.

TABLE II. Length of pipe section

Pipe No	Pipe length/m	Water distribution length/m	Pipe No	Pipe length/m	Water distribution length/m
JS1-JS2	230.62	0	JS11-JS12	722.97	722.97
JS2-JS3	501.65	501.65	JS11-JS18	1047.08	1047.08
JS2-JS8	230.39	115.20	JS12-JS13	724.92	724.92
JS3-JS4	724.92	724.92	JS12-JS19	1047.08	1047.08
JS3-JS12	647.19	647.19	JS13-JS14	678.53	678.53
JS4-JS5	678.53	678.53	JS13-JS20	1047.08	1047.08
JS4-JS13	647.19	647.19	JS14-JS15	710.42	710.42
JS5-JS6	710.42	710.42	JS14-JS21	1041.79	1041.79
JS5-JS14	647.19	647.19	JS15-JS16	919.48	919.48
JS6-JS7	919.48	919.48	JS15-JS22	1041.79	1041.79

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 121-132
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

JS6-JS15	647.19	647.19	JS16-JS23	1041.78	1041.79
JS7-JS16	647.19	647.19	JS17-JS18	350.11	350.11
JS8-JS9	361.41	180.71	JS18-JS19	720.72	720.72
JS8-JS11	583.17	583.17	JS19-JS20	724.92	724.92
JS9-JS10	345.57	172.79	JS20-JS21	678.53	678.53
JS10-JS11	347.30	347.3	JS21-JS22	710.42	710.42
JS10-JS17	1047.08	523.54	JS22-JS23	919.48	919.48

TABLE III. Flow along the pipeline section

Pipe No	Flow along the line /$L.s^{-1}$	Pipe No	Flow along the line /$L.s^{-1}$	Pipe No	Flow along the line/$L.s^{-1}$
JS1-JS2	00.00	JS8-JS9	11.48	JS14-JS21	66.15
JS2-JS3	31.85	JS8-JS11	37.03	JS15-JS16	58.39
JS2-JS8	7.32	JS9-JS10	10.97	JS15-JS22	66.15
JS3-JS4	46.03	JS10-JS11	22.05	JS16-JS23	66.15
JS3-JS12	41.10	JS10-JS17	33.24	JS17-JS18	22.23
JS4-JS5	43.09	JS11-JS12	45.91	JS18-JS19	45.77
JS4-JS13	41.10	JS11-JS18	66.49	JS19-JS20	46.03
JS5-JS6	45.11	JS12-JS13	46.03	JS20-JS21	43.09
JS5-JS14	41.10	JS12-JS19	66.49	JS21-JS22	45.11
JS6-JS7	58.39	JS13-JS14	43.09	JS22-JS23	58.39
JS6-JS15	41.10	JS13-JS20	66.49		
JS7-JS16	41.10	JS14-JS15	45.11		

TABLE IV. Node flow

Node number	Node flow/ $L.s^{-1}$	Node number	Node flow/ $L.s^{-1}$	Node number	Node flow/ $L.s^{-1}$	Node number	Node flow/ $L.s^{-1}$
JS1	-1571.81	JS7	49.75	JS13	98.36	JS19	79.15
JS2	19.59	JS8	27.92	JS14	97.73	JS20	77.81
JS3	59.49	JS9	11.23	JS15	105.38	JS21	77.18
JS4	65.11	JS10	33.13	JS16	82.82	JS22	84.83
JS5	64.65	JS11	85.74	JS17	27.74	JS23	62.27
JS6	72.30	JS12	99.77	JS18	67.25		

TABLE V. Design ground elevation of nodes

Node number	Ground elevation/m	Node number	Ground elevation/m	Node number	Ground elevation/m
JS1	133.15	JS9	134.12	JS17	135.60
JS2	133.74	JS10	134.51	JS18	135.82
JS3	134.05	JS11	134.77	JS19	136.90
JS4	134.36	JS12	135.24	JS20	137.45
JS5	134.50	JS13	135.73	JS21	137.90
JS6	134.67	JS14	136.00	JS22	137.92
JS7	134.90	JS15	136.48	JS23	137.21
JS8	133.74	JS16	136.80		

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 121-132
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

Click the adjustment in the menu bar to define the design ground elevation of the node. After calculation according to the contour line and interpolation method, input it successively according to Table V and select the input node flow. The water source node is input according to the negative value, and the large user is treated according to the centralized flow and added to the nearest node in the pipe network layout separately. For example, industrial enterprise 2 is added to js16 node as the centralized flow, Industrial enterprise 1 is added to js23 node as centralized flow, railway station is added to JS20 node as centralized flow, and the water transmission pipe from water plant to pipe network is defined as double pipe.

4.2 Pipe Network Adjustment

Pipe network adjustment refers to the hydraulic calculation process of annular pipe network after preliminary distribution of flow and determination of pipe diameter, when the closure error of each ring of pipe network cannot meet the continuity (node) equations and energy (ring) equations at the same time, the flow of each pipe section needs to be redistributed and calculated repeatedly until the above equations are met at the same time [5,6].

4.2.1. Adjustment of backwater pressure pipe network

(1) Pipe section flow

According to other default conditions of the system, if it is a new pipe network, first carry out the pipe network adjustment of anti water source pressure. First, carry out the initial distribution of the pipe network, use the maximum hourly water consumption to distribute the flow of the pipe network, and preliminarily determine the calculated flow of the pipe section to determine the pipe diameter. However, the pipe diameter is not only related to the flow of the pipe section, but also related to the flow rate. Therefore, after the calculated flow of the pipe section is preliminarily determined, the flow rate needs to be selected to determine the pipe diameter. After the preliminarily determined pipe diameter and node flow in the software are input for adjustment, the flow of the pipe section will be distributed according to the hydraulic characteristics of the pipe network, and its value is not equal to the flow at the time of initial distribution, then directly adjust to the appropriate pipe diameter according to the limit flow Table VI [5], and the results are shown in Table VII and Table VIII.

TABLE VI. Limit flow

Pipe diameter/ mm	Limit flow/ $L.s^{-1}$	Pipe diameter/ mm	Limit flow/ $L.s^{-1}$	Pipe diameter/ mm	Limit flow/ $L.s^{-1}$
100	<9	350	68~96	700	355~490
150	9~15	400	96~130	800	490~685
200	15~28.5	450	130~168	900	685~822
250	28.5~45	500	168~237	1000	822~1120
300	45~68	600	237~355		

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 121-132
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

TABLE VII. Node parameters for back calculation of water source pressure adjustment

Node number	Flow/L.s^{-1}	Ground elevation/m	Node water pressure/m	Free head/m
JS1	-1571.920	133.150	176.224	43.074
JS2	19.590	133.740	175.788	42.048
JS3	59.490	134.050	174.693	40.643
JS4	65.110	134.360	172.996	38.636
JS5	64.650	134.500	172.006	37.506
JS6	72.300	134.670	169.791	35.121
JS7	49.750	134.900	167.724	32.824
JS8	27.920	133.740	175.433	41.693
JS9	11.230	134.120	175.171	41.051
JS10	33.130	134.510	174.930	40.420
JS11	85.740	134.770	174.784	40.014
JS12	99.770	135.240	173.852	38.612
JS13	98.360	135.730	172.087	36.357
JS14	97.730	136.000	171.146	35.146
JS15	105.380	136.480	168.495	32.015
JS16	133.750	136.800	165.314	28.514
JS17	27.740	135.600	174.139	38.539
JS18	67.250	135.820	172.818	36.998
JS19	79.150	136.900	170.825	33.925
JS20	104.430	137.450	168.234	30.784
JS21	77.180	137.900	166.271	28.371
JS22	84.830	137.920	164.362	26.442
JS23	107.440	137.210	161.210	24.000

TABLE VIII. Pipeline parameters calculated by back calculation of water source pressure adjustment

Pipe No	Pipe diameter /mm	Pipe length/m	Flow/L.s^{-1}	Velocity/m.s^{-1}	Km loss/m	Pipeline loss/m
JS1-JS2	2x900	230.616	1571.920	1.185	1.891	0.436
JS2-JS3	900	501.646	849.450	1.281	2.183	1.095
JS2-JS8	900	230.391	702.880	1.060	1.538	0.354
JS3-JS4	800	724.922	650.114	1.237	2.341	1.697
JS3-JS12	500	647.187	139.846	0.674	1.299	0.840
JS4-JS5	800	678.527	503.332	0.958	1.458	0.989
JS4-JS13	400	647.187	81.672	0.613	1.404	0.908
JS5-JS6	600	710.424	359.392	1.210	3.119	2.216
JS5-JS14	400	647.187	79.290	0.595	1.329	0.860
JS6-JS7	500	919.479	188.131	0.907	2.248	2.067
JS6-JS15	400	647.187	98.960	0.742	2.002	1.296

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 121-132
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

JS7-JS16	400	647.187	138.381	1.038	3.723	2.410
JS8-JS9	900	361.406	468.939	0.707	0.727	0.263
JS8-JS11	600	583.171	206.021	0.694	1.114	0.650
JS9-JS10	900	345.566	457.709	0.690	0.695	0.240
JS10-JS11	800	347.296	257.488	0.490	0.422	0.147
JS10-JS17	600	1047.075	167.092	0.562	0.756	0.792
JS11-JS12	700	722.967	332.046	0.825	1.289	0.932
JS11-JS18	300	1047.078	45.723	0.602	1.877	1.966
JS12-JS13	600	724.920	314.380	1.058	2.435	1.765
JS12-JS19	300	1047.075	57.742	0.760	2.891	3.027
JS13-JS14	600	678.530	231.909	0.781	1.387	0.941
JS13-JS20	300	1047.075	65.783	0.866	3.680	3.853
JS14-JS15	400	710.420	138.556	1.039	3.732	2.651
JS14-JS21	300	1041.79	74.913	0.986	4.680	4.876
JS15-JS16	300	919.480	63.622	0.838	3.459	3.181
JS15-JS22	300	1041.79	68.514	0.902	3.967	4.133
JS16-JS23	300	1041.79	68.253	0.898	3.940	4.104
JS17-JS18	400	350.110	139.352	1.045	3.772	1.321
JS18-JS19	400	720.720	117.825	0.884	2.765	1.993
JS19-JS20	350	724.920	96.416	0.937	3.574	2.591
JS20-JS21	300	678.530	57.769	0.760	2.894	1.963
JS21-JS22	300	710.420	55.503	0.731	2.687	1.909
JS22-JS23	250	919.480	39.187	0.744	3.428	3.152

(2) Pump head

1) Determine control points

First, suppose a control point. The control point is the node where the water pressure of the water supply network is most difficult to meet, generally the point farthest from the secondary pump station or the point with special water pressure requirements [6]. In the layout plan, node js23 is the farthest from the county seat and has high requirements for water pressure. Therefore, js23 is preliminarily selected as the control point, and the node parameters are calculated by inverse calculation of water source pressure adjustment according to Table VII. The water pressure of other nodes is higher than that of js23 node. Therefore, js23 is the control point in the whole pipe network, and the total head of node js23 is 161.20m.

2) Pump selection

Referring to common equipment in volume 11 of water supply and drainage design manual, five kqsn400-m13 water pumps are selected, with specifications of 438, four in service and one for standby, which are used in parallel. See Table IX for pump parameters.

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 121-132
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

TABLE IX. Performance of kqsn split type single pole double suction centrifugal pump (34)

Pump model	Specifications	Flow/		Lift/ m	Rotational speed/ $r.min^{-1}$	Power/ kW		Efficiency/ %	(NPSH) /r(m)	Pump weight/ kg
		$m^3 \cdot h^{-1}$	$L.s^{-1}$							
KQSN400-M13	481	1215	337.5	71	1480	313.2	450	75	7.3	1652
		2025	562.5	59		374.0		87		
		2520	700.0	51		416.7		84		
	470	1211	336.4	65	1480	282.0	355	76	7.2	1650
		2018	560.6	52		324.7		88		
		2502	695.0	43		344.7		85		
	438	1148	318.9	57	1480	240.9	315	74	7.1	1647
		1914	531.7	45		272.5		86		
		2393	664.7	37		290.5		83		

4.2.2 Fire fighting and accident check

The water supply network is designed according to the maximum daily and hourly water consumption, and the pipe diameter and pump head are designed according to the working conditions at this time. In general, they can meet the requirements of water supply, but under some special requirements, they may not be able to ensure water supply, so it is necessary to check the pipe network design.

(1) Fire control check

The fire water consumption, water pressure and duration are in accordance with the code for fire protection design of buildings [7] and the technical code for fire water supply and hydrant system [8]. According to the background data, the recent population of the county is 250000, so the number of fires in the same time is considered as two, the design flow of one fire is 60L / s, and the two fire flows are added to the control point js23 and the large user js16 respectively, The fire water pressure only needs to meet 10m water column. The calculated lift under the working condition of water pump in the pipe stand is 40.685, so the water pressure at js1 node is 173.835, which is used as the control water pressure of the pipe network. The adjustment results are shown in Table X.

TABLE X. Fire control check

Node number	Flow /$L.s^{-1}$	Ground elevation /m	Node water pressure/m	Free head /m
JS1	-845.960	133.150	171.493	38.343
JS2	19.590	133.740	170.993	37.253
JS3	59.490	134.050	169.719	35.669
JS4	65.110	134.360	167.652	33.292
JS5	64.650	134.500	166.385	31.885
JS6	72.300	134.670	163.296	28.626
JS7	49.750	134.900	159.862	24.962

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 121-132
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

JS8	27.920	133.740	170.594	36.854
JS9	11.230	134.120	170.360	36.240
JS10	33.130	134.510	170.147	35.637
JS11	85.740	134.770	170.035	35.265
JS12	99.770	135.240	168.887	33.647
JS13	98.360	135.730	166.719	30.989
JS14	97.730	136.000	165.497	29.497
JS15	105.380	136.480	161.714	25.234
JS16	193.750	136.800	155.196	18.396
JS17	27.740	135.600	169.307	33.707
JS18	67.250	135.820	167.889	32.069
JS19	79.150	136.900	165.649	28.749
JS20	104.430	137.450	162.548	25.098
JS21	77.180	137.900	159.711	21.811
JS22	84.830	137.920	156.339	18.419
JS23	167.440	137.210	147.210	10.000

Through calculation, the node water pressure js1 is 171.493＜173.835, meeting the requirements.

(2) Accident check

For the accident check, the front end of the pipe network, that is, the relatively thick pipe section, which has a great impact on the whole water supply system, is selected as the accident pipe section. The j22-js3 pipe section with a diameter of 900mm is selected as the accident pipe section. The flow of other nodes becomes 70% of the node flow at the highest point. The minimum water pressure at the control point is the same as the requirements at the highest point, that is, the minimum water pressure is 24mh2o, and the head calculated under the working condition of water pump in the pipe stand is 49.265, Then the water pressure of js1 node is 182.415, which is used as the control water pressure of the pipe network. The adjustment results are shown in Table XI.

TABLE XI. Accident check

Node number	Flow /L.s^{-1}	Ground elevation /m	Node water pressure/m	Free head/m
JS1	-550.172	133.150	173.347	40.197
JS2	13.713	133.740	173.121	39.381
JS3	41.643	134.050	167.094	33.044
JS4	45.577	134.360	166.772	32.412
JS5	45.255	134.500	166.436	31.936
JS6	50.610	134.670	165.393	30.723
JS7	34.825	134.900	164.364	29.464
JS8	19.544	133.740	172.328	38.588

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 121-132
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

JS9	7.861	134.120	171.881	37.761
JS10	23.191	134.510	171.463	36.953
JS11	60.018	134.770	171.052	36.282
JS12	69.839	135.240	168.595	33.355
JS13	68.852	135.730	167.317	31.587
JS14	68.411	136.000	166.438	30.438
JS15	73.766	136.480	164.885	28.405
JS16	93.625	136.800	163.182	26.382
JS17	19.418	135.600	170.858	35.258
JS18	47.075	135.820	169.778	33.958
JS19	55.405	136.900	167.899	30.999
JS20	73.101	137.450	165.855	28.405
JS21	54.026	137.900	164.314	26.414
JS22	59.381	137.920	163.048	25.128
JS23	75.208	137.210	161.210	24.000

The calculation result shows that the node water pressure js1 is 173.347<182.415, which meets the requirements and there is no need to adjust the pipe diameter of the pipe section.

V. CONCLUSION

Starting from the significance of teaching psychology to pipe network design, this paper applies Hongye guanlide software to a county in Hunan, introduces in detail its pipe network design teaching with the combination of manual and software, optimizes the pipe network combination through parameter calibration, quickly and conveniently carries out the adjustment calculation of water supply pipe network, and stimulates students' learning motivation, It promotes students' enthusiasm and initiative in learning pipe network design, improves students' skills in mastering the software, and lays a solid foundation for relevant work in the future.

ACKNOWLEDGEMENTS

This research was supported by Anhui provincial quality engineering project of colleges and universities (Grant No.2020mooc538); Provincial Natural Science Research Project of Anhui colleges and universities (Grant No.kj2019a0621).

REFERENCES

[1] Tang XL, Zhang YL (2013) Analysis and Application of Hydraulic Model of Distribution System Based on Model Online Software. Resource Development & Market, 29(3): 261-262
[2] Guang LS, pipinglader software. http://bim.hongye.com.cn/index/chan-pindetail2/id/13.html.
[3] GB50013-2018, Standard for design of outdoor water supply engineering.
[4] GB50282-2016, Code for urban water supply engineering planning.
[5] Yan XS, Fan JC (1999) Water supply engineering.4th ed. Beijing: China Architecture & Building Press

Forest Chemicals Review
www.forestchemicalsreview.com
ISSN: 1520-0191
March-April 2022 Page No. 121-132
Article History: Received: 08 February 2022, Revised: 10 March 2022, Accepted: 02 April 2022, Publication: 30 April 2022

[6] Yan XS, Liu SQ (2014) Water supply and drainage network system. 3th ed. Beijing: China Architecture & Building Press
[7] GB50016-2014, Code for fire protection design of buildings.
[8] GB50974-2014, Technical code for fire protection water supply and hydrant systems.