哈尔滨工业大学（深圳）

机械设计大作业设计说明书

设计题目：	V带传动电算
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哈爾濱工業大學(深圳)

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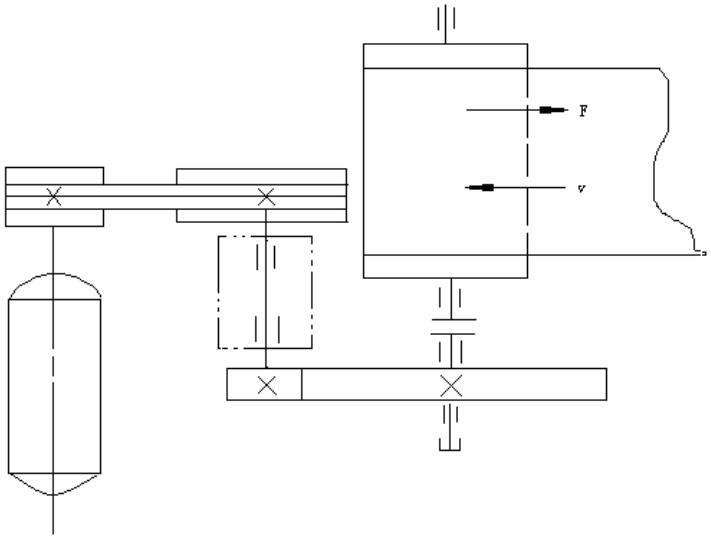
哈尔滨工业大学（深圳）

机械设计大作业设计任务书

题目：V 带传动电算

带式运输机的传动方案如下图所示，机器工作平稳、单向回转、成批生产，其他数据见下表。



带式运输机的传动方案示意图

带式运输机中 V 带传动的已知数据

方案	电动机工作功率 P_d/kW	电动机满载转速 n_m/(r/min)	工作机的转速 n_w/(r/min)	第一级传动比 i_1	轴承座中心高 H/mm	最短工作年限	工作环境
5.1.4	2.2	940	80	2.1	160	5 年 2 班	室内清洁

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一、设计思路

输入原始数据：P，n_1，i，包括已给定和人为假定的数据。人为给定的一些条件代号，如 Z、A、B、C、D、E 六种带型号可使用变量 TYPE 来表示，分别对应六种型号，然后使用 MATLAB 进行 GUI 编程计算出其余参数值并显示出来。

二、变量说明

表 1　V 带电算程序变量标识符

序号	名称	代号	标识符	单位
1	名义功率	P	P	kW
2	设计功率	P_d	Pd	kW
3	工作情况系数	K_A	Ka	
4	小带轮转速	n_1	n1	r/min
5	工作机载荷特性		GZJ	
6	原动机类型		YDJ	
7	带型号	Z、A—E	TYPE	
8	小带轮基准直径	d_{d1}	dd1	mm
9	大带轮基准直径	d_{d2}	dd2	mm
10	最小带轮直径	d_{dmin}	ddMIN	mm
11	带速	v	V	m/s
12	最大带速	v_{max}	Vmax	m/s
13	中心距	a	a	mm
14	基准长度	L_d	Ld	mm
15	小带轮包角	α_1	alf1	°
16	V 带根数	Z	Z	
17	额定功率	P_0	P0	kW
18	弯曲影响系数	K_b	Kb	
19	传动比系数	K_i	Ki	
20	长度系数	K_L	KL	
21	包角系数	K_α	KALF	
22	初拉力	F_0	F0	N
23	压轴力	F_Q	FQ	N

三、程序框图

程序框图如图 1 所示。

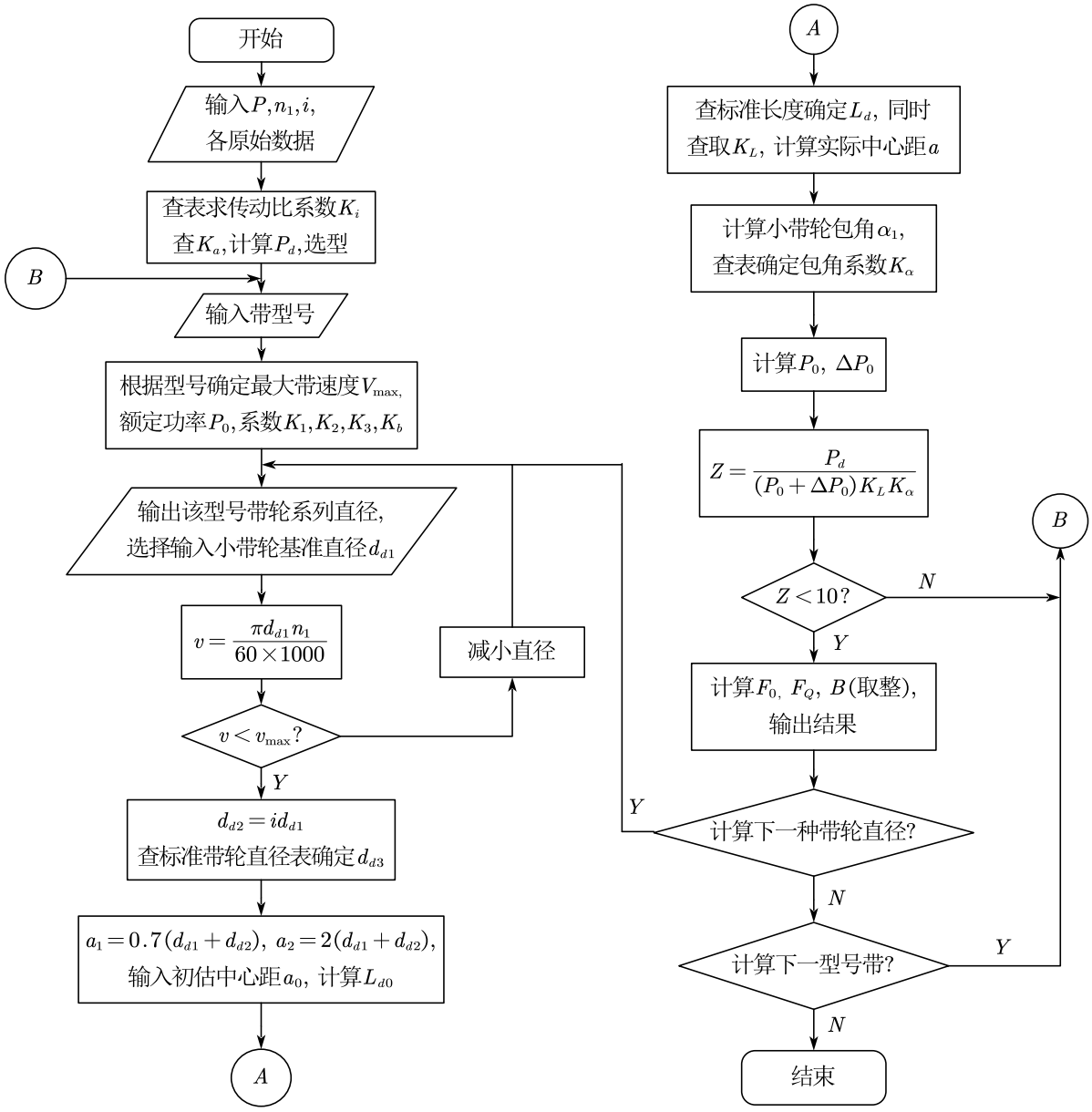

图 1 程序框图

四、MATLAB 源代码

```
function varargout = VBC(varargin)
%  VBC MATLAB code for VBC.fig
%  VBC means V Belt Calculation
%  Designer: JingXuan Yang
%  Date: 2018/12/08
%  VBC, by itself, creates a new VBC or raises the existing
%  singleton*.
%  H = VBC returns the handle to a new VBC or the handle to
%  the existing singleton*.
%
%  VBC('CALLBACK',hObject,eventData,handles,...) calls the local
%  function named CALLBACK in VBC.M with the given input arguments.
%
%  VBC('Property','Value',...) creates a new VBC or raises the
%  existing singleton*.  Starting from the left, property value pairs are
%  applied to the GUI before VBC_OpeningFcn gets called.  An
%  unrecognized property name or invalid value makes property application
%  stop.  All inputs are passed to VBC_OpeningFcn via varargin.
%
%  *See GUI Options on GUIDE's Tools menu.  Choose "GUI allows only one
%  instance to run (singleton)".
%
% See also: GUIDE, GUIDATA, GUIHANDLES

% Edit the above text to modify the response to help VBC

% Last Modified by GUIDE v2.5 08-Dec-2018 19:15:20

% Begin initialization code - DO NOT EDIT
gui_Singleton = 1;
gui_State = struct('gui_Name',       mfilename, ...
                   'gui_Singleton',  gui_Singleton, ...
                   'gui_OpeningFcn', @VBC_OpeningFcn, ...
                   'gui_OutputFcn',  @VBC_OutputFcn, ...
                   'gui_LayoutFcn',  [] , ...
                   'gui_Callback',   []);
if nargin && ischar(varargin{1})
    gui_State.gui_Callback = str2func(varargin{1});
end

if nargout
    [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
else
    gui_mainfcn(gui_State, varargin{:});
end
% End initialization code - DO NOT EDIT


% --- Executes just before VBC is made visible.
function VBC_OpeningFcn(hObject, eventdata, handles, varargin)
% This function has no output args, see OutputFcn.
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% varargin   command line arguments to VBC (see VARARGIN)


```

```
global Pd yilei erlei chuandongbi zhuansu TYPE Dd1array Dd1 MINMAX
P0array...
Narray Vmax Ldarray Dd1pos Kaarray Klarray Dd2array DSPcellarray CELLDSP
TABLEPOS HEADMES;

Vmax = 25;
%Basic rated power of common V-belt
P0array = [
0.00
0.04,0.06,0.09,0.10,0.12,0.14,0.16,0.17,0.20,0.22,0.26,0.28,0.30,0.32,0.33,
0.34,0.33,0.31;
0.00
0.05,0.08,0.13,0.15,0.18,0.22,0.25,0.27,0.32,0.37,0.41,0.45,0.47,0.49,0.50,
0.50,0.49,0.48;
0.00
0.06,0.09,0.17,0.20,0.23,0.27,0.30,0.33,0.39,0.46,0.50,0.54,0.58,0.61,0.62,
0.62,0.61,0.58;
0.00
0.10,0.14,0.20,0.22,0.26,0.30,0.35,0.39,0.44,0.50,0.56,0.61,0.64,0.67,0.67,
0.66,0.64,0.00;
0.00
0.15,0.26,0.40,0.45,0.51,0.60,0.68,0.73,0.84,0.92,1.00,1.04,1.08,1.09,1.07,
1.02,0.96,0.80;
0.00
0.22,0.39,0.61,0.68,0.77,0.93,1.07,1.05,1.34,1.50,1.64,1.73,1.83,1.87,1.88,
1.82,0.00,0.00;
0.00
0.26,0.47,0.74,0.83,0.95,1.14,1.32,1.42,1.66,1.87,2.05,2.19,2.28,2.34,2.33,
0.00,0.00,0.00;
0.00 0.37,0.67,1.07,1.19 1.37 1.66 1.92 2.07 2.44 2.74 2.98 3.16 3.26 0.00
0.00 0.00 0.00 0.00;
0.00 0.48 0.84 1.30 1.44 1.64 1.93 2.19 2.33 2.64 2.85 2.96 2.94 2.80 0.00
0.00 0.00 0.00 0.00;
0.00 0.59 1.05 1.64 1.82 2.08 2.47 2.82 3.00 3.42 3.70 3.85 3.83 0.00 0.00
0.00 0.00 0.00 0.00;
0.00 0.74 1.32 2.09 2.32 2.66 3.17 3.62 3.86 4.40 4.75 4.89 0.00 0.00 0.00
0.00 0.00 0.00 0.00;
0.00 0.88 1.59 2.53 2.81 3.22 3.85 4.39 4.68 5.30 5.67 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00;
0.00 1.39 2.41 3.69 4.07 4.58 5.29 5.84 6.07 6.34 6.02 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00;
0.00 2.03 3.62 5.64 6.23 7.04 8.21 9.04 9.38 9.62 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00;
0.00 2.84 5.14 8.09 8.92 10.05 11.53 12.46 12.72  0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00;
0.00 3.91 7.06 11.02 12.10 13.48 15.04 0.0 0.000  0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00;
3.01 5.31 9.24 13.70 14.83 16.15 17.25 16.77 15.63 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00;
3.66 6.52 11.45 17.07 18.46 20.06 21.20 0.00 0.000 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00;
4.37 7.90 13.85 20.63 22.25 24.01 24.84 0.00 0.000 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00;
5.08 9.21 16.20 23.99 25.76 27.50 0.000 0.00 0.000 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00;
6.21 10.86 18.55 26.21 27.57 28.32 0.00 0.00 0.000 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00;
7.32 13.09 22.49 31.59 33.03 33.40 0.00 0.00 0.000 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00;
8.75 15.65 26.95 37.26 38.62 0.000 0.00 0.00 0.000 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00;
```

```
10.31 18.52 31.83 42.87 43.52 0.00 0.00 0.00 0.000 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00;
];

%range of n1 for every specific belt
MINMAX = [950,6000;800,6000;700,6000;700,6000;200,600;200,6000;200,6000;
          200,5500;200,6000;200,5000;200,4500;200,3600;200,3600;200,3200;
          200,2800;200,2400;200,2400;200,2000;200,1600;200,1200;

100,1600;100,1200;100,1200;100,950;100,950;100,950;100,800;100,800;];

%basic n1 values
Narray =
[100,200,400,700,800,950,1200,1450,1600,2000,2400,2800,3200,3600,4000,4500,
5000,5500,6000];

%Datum length
Ldarray =
[200,224,250,280,315,355,400,450,500,560,630,710,800,900,1000,1120,1250,140
0,1600,1800,2000,2240,2500,2800,3150,3550,4000,4500,5000];

%Optimum selection of pulley diameter series
Dd2array =
[20,28,31.5,35.5,40,45,50,56,63,71,80,90,100,112,125,140,150,160,180,200,22
4,250,280,315,355,400,425,450,500,560,600,630,710,800];

%two classes for Ka
yilei = [1:0.1:1.2; 1.1:0.1:1.3; 1.2:0.1:1.4; 1.3:0.1:1.5];%I-class
erlei = [1.1:0.1:1.3; 1.2:0.1:1.4; 1.4:0.1:1.6; 1.5,1.6,1.8];%II-class

%atually this Ka is K\alpha
Kaarray = [220,210,200,190,180,170,160,150,140,130,120,110,100,90;

1.20,1.15,1.10,1.05,1.00,0.98,0.95,0.92,0.89,0.86,0.82,0.78,0.73,0.68];

%
Klarray = [
200  zeros(1,6);
224  zeros(1,6);
250  zeros(1,6);
280 zeros(1,6);
315  zeros(1,6);
355  zeros(1,6);
400  0.87 zeros(1,5);
450  0.89 zeros(1,5);
500 0.91 zeros(1,5);
560 0.94 zeros(1,5);
630 0.96 0.81 zeros(1,4);
710 0.99 0.83 zeros(1,4);
800 1.00 0.85 zeros(1,4);
900 1.03 0.87 0.82 zeros(1,3);
1000 1.06 0.89 0.84 zeros(1,3);
1120 1.08 0.91 0.86 zeros(1,3);
1250 1.10 0.93 0.88 zeros(1,3);
1400 1.14 0.96 0.90 zeros(1,3);
1600 1.16 0.99 0.92 0.83 0 0;
1800 1.18 1.01 0.95 0.86 0 0;
2000 0 1.03 0.98 0.88 0 0;
2240 0 1.06 1.00 0.91 0 0;
2500 0 1.09 1.03 1.93 0 0;
2800 0 1.11 1.05 0.95 0.83 0;
```

```
3150 0 1.13 1.07 0.97 0.86 0;
3550 0 1.17 1.09 0.99 0.89 0;
4000 0 1.19 1.13 1.02 0.91 0;
4500 0 0 1.15 1.04 0.93 0.90;
5000 0 0 1.18 1.07 0.96 0.92];

%Minimum datum diameter of V-belt pulley
Dd1array = [50 63 71 80 75 90 100 125 140 160 180 200 250 315 400 355 400
450 500 560 630 710];

TABLEPOS = 1;

%clear table results
changetabledsp(handles.uitable1,'deleteall',TABLEPOS,TYPE);

%clear a0 value
set(handles.edit9,'string','');

% Choose default command line output for VBC
handles.output = hObject;

% Update handles structure
guidata(hObject, handles);

% UIWAIT makes VBC wait for user response (see UIRESUME)
% uiwait(handles.figure1);


% --- Outputs from this function are returned to the command line.
function varargout = VBC_OutputFcn(hObject, eventdata, handles)
% varargout  cell array for returning output args (see VARARGOUT);
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Get default command line output from handles structure
varargout{1} = handles.output;



function edit1_Callback(hObject, eventdata, handles)
% hObject    handle to edit1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of edit1 as text
%        str2double(get(hObject,'String')) returns contents of edit1 as a
double


% --- Executes during object creation, after setting all properties.
function edit1_CreateFcn(hObject, eventdata, handles)
% hObject    handle to edit1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
```

```
241 end
242
243
244
245 function edit2_Callback(hObject, eventdata, handles)
246 % hObject    handle to edit2 (see GCBO)
247 % eventdata  reserved - to be defined in a future version of MATLAB
248 % handles    structure with handles and user data (see GUIDATA)
249
250 % Hints: get(hObject,'String') returns contents of edit2 as text
251 %        str2double(get(hObject,'String')) returns contents of edit2 as a
252 double
253
254
255 % --- Executes during object creation, after setting all properties.
256 function edit2_CreateFcn(hObject, eventdata, handles)
257 % hObject    handle to edit2 (see GCBO)
258 % eventdata  reserved - to be defined in a future version of MATLAB
259 % handles    empty - handles not created until after all CreateFcns called
260
261 % Hint: edit controls usually have a white background on Windows.
262 %       See ISPC and COMPUTER.
263 if ispc && isequal(get(hObject,'BackgroundColor'),
264 get(0,'defaultUicontrolBackgroundColor'))
265     set(hObject,'BackgroundColor','white');
266 end
267
268
269
270 function edit3_Callback(hObject, eventdata, handles)
271 % hObject    handle to edit3 (see GCBO)
272 % eventdata  reserved - to be defined in a future version of MATLAB
273 % handles    structure with handles and user data (see GUIDATA)
274
275 % Hints: get(hObject,'String') returns contents of edit3 as text
276 %        str2double(get(hObject,'String')) returns contents of edit3 as a
277 double
278
279
280 % --- Executes during object creation, after setting all properties.
281 function edit3_CreateFcn(hObject, eventdata, handles)
282 % hObject    handle to edit3 (see GCBO)
283 % eventdata  reserved - to be defined in a future version of MATLAB
284 % handles    empty - handles not created until after all CreateFcns called
285
286 % Hint: edit controls usually have a white background on Windows.
287 %       See ISPC and COMPUTER.
288 if ispc && isequal(get(hObject,'BackgroundColor'),
289 get(0,'defaultUicontrolBackgroundColor'))
290     set(hObject,'BackgroundColor','white');
291 end
292
293
294 % --- Executes on selection change in popupmenu1.
295 function popupmenu1_Callback(hObject, eventdata, handles)
296 % hObject    handle to popupmenu1 (see GCBO)
297 % eventdata  reserved - to be defined in a future version of MATLAB
298 % handles    structure with handles and user data (see GUIDATA)
299
300 % Hints: contents = cellstr(get(hObject,'String')) returns popupmenu1
301 contents as cell array
```

```
302 %        contents{get(hObject,'Value')} returns selected item from
303 popupmenu1
304
305
306 % --- Executes during object creation, after setting all properties.
307 function popupmenu1_CreateFcn(hObject, eventdata, handles)
308 % hObject    handle to popupmenu1 (see GCBO)
309 % eventdata  reserved - to be defined in a future version of MATLAB
310 % handles    empty - handles not created until after all CreateFcns called
311
312 % Hint: popupmenu controls usually have a white background on Windows.
313 %       See ISPC and COMPUTER.
314 if ispc && isequal(get(hObject,'BackgroundColor'),
315 get(0,'defaultUicontrolBackgroundColor'))
316     set(hObject,'BackgroundColor','white');
317 end
318
319
320 % --- Executes on selection change in popupmenu2.
321 function popupmenu2_Callback(hObject, eventdata, handles)
322 % hObject    handle to popupmenu2 (see GCBO)
323 % eventdata  reserved - to be defined in a future version of MATLAB
324 % handles    structure with handles and user data (see GUIDATA)
325
326 % Hints: contents = cellstr(get(hObject,'String')) returns popupmenu2
327 contents as cell array
328 %        contents{get(hObject,'Value')} returns selected item from
329 popupmenu2
330
331
332 % --- Executes during object creation, after setting all properties.
333 function popupmenu2_CreateFcn(hObject, eventdata, handles)
334 % hObject    handle to popupmenu2 (see GCBO)
335 % eventdata  reserved - to be defined in a future version of MATLAB
336 % handles    empty - handles not created until after all CreateFcns called
337
338 % Hint: popupmenu controls usually have a white background on Windows.
339 %       See ISPC and COMPUTER.
340 if ispc && isequal(get(hObject,'BackgroundColor'),
341 get(0,'defaultUicontrolBackgroundColor'))
342     set(hObject,'BackgroundColor','white');
343 end
344
345
346 % --- Executes on selection change in popupmenu3.
347 function popupmenu3_Callback(hObject, eventdata, handles)
348 % hObject    handle to popupmenu3 (see GCBO)
349 % eventdata  reserved - to be defined in a future version of MATLAB
350 % handles    structure with handles and user data (see GUIDATA)
351
352 % Hints: contents = cellstr(get(hObject,'String')) returns popupmenu3
353 contents as cell array
354 %        contents{get(hObject,'Value')} returns selected item from
355 popupmenu3
356
357
358 % --- Executes during object creation, after setting all properties.
359 function popupmenu3_CreateFcn(hObject, eventdata, handles)
360 % hObject    handle to popupmenu3 (see GCBO)
361 % eventdata  reserved - to be defined in a future version of MATLAB
362 % handles    empty - handles not created until after all CreateFcns called
```

```
363
364 % Hint: popupmenu controls usually have a white background on Windows.
365 %       See ISPC and COMPUTER.
366 if ispc && isequal(get(hObject,'BackgroundColor'),
367 get(0,'defaultUicontrolBackgroundColor'))
368     set(hObject,'BackgroundColor','white');
369 end
370
371
372 % --- Executes on button press in pushbutton2.
373 function pushbutton2_Callback(hObject, eventdata, handles)
374 % hObject    handle to pushbutton2 (see GCBO)
375 % eventdata  reserved - to be defined in a future version of MATLAB
376 % handles    structure with handles and user data (see GUIDATA)
377 global Pd yilei erlei chuandongbi zhuansu TYPE Dd2array Dd1 Dd2 TABLEPOS
378 HEADMES;
379 for i=1:1
380     p = get(handles.edit1,'string');   %power
381     n1 = get(handles.edit3,'string');  %spin speed
382     cd = get(handles.edit2,'string');  %ratio of movement
383     gonglv = eval(p);%the next three line maybe of no use
384     zhuansu = eval(n1);
385     chuandongbi = eval(cd);
386
387     GZJ=get(handles.popupmenu2,'value'); %working machine
388     SJ=get(handles.popupmenu1,'value');  %working time hour per day
389     YDJ=get(handles.popupmenu3,'value'); %type of prime mover
390
391     if(YDJ == 1 || YDJ == 3 || YDJ == 4 || YDJ == 6)
392         leibie = 1; %I-class
393     else
394         leibie = 2; %II-class
395     end
396
397     if(leibie == 1)
398             Ka = yilei(GZJ,SJ);
399     else
400             Ka = erlei(GZJ,SJ);
401     end
402
403     check1 = get(handles.checkbox1,'value');
404     check2 = get(handles.checkbox2,'value');
405     check3 = get(handles.checkbox3,'value');
406
407     gongzuochanghe = check1 | check2 | check3;
408
409     if(gongzuochanghe == 1)%existing 1 is 1
410         Ka = Ka*1.2;
411     end
412
413     Pd=Ka*gonglv;
414     xianshi=sprintf('%0.2f %s',Pd);
415     set(handles.edit6,'string',xianshi);
416
417 end
418
419
420 function edit6_Callback(hObject, eventdata, handles)
421 % hObject    handle to edit6 (see GCBO)
422 % eventdata  reserved - to be defined in a future version of MATLAB
423 % handles    structure with handles and user data (see GUIDATA)
```

```
424
425 % Hints: get(hObject,'String') returns contents of edit6 as text
426 %        str2double(get(hObject,'String')) returns contents of edit6 as a
427 double
428
429
430 % --- Executes during object creation, after setting all properties.
431 function edit6_CreateFcn(hObject, eventdata, handles)
432 % hObject    handle to edit6 (see GCBO)
433 % eventdata  reserved - to be defined in a future version of MATLAB
434 % handles    empty - handles not created until after all CreateFcns called
435
436 % Hint: edit controls usually have a white background on Windows.
437 %       See ISPC and COMPUTER.
438 if ispc && isequal(get(hObject,'BackgroundColor'),
439 get(0,'defaultUicontrolBackgroundColor'))
440     set(hObject,'BackgroundColor','white');
441 end
442
443
444 % --- Executes on button press in checkbox1.
445 function checkbox1_Callback(hObject, eventdata, handles)
446 % hObject    handle to checkbox1 (see GCBO)
447 % eventdata  reserved - to be defined in a future version of MATLAB
448 % handles    structure with handles and user data (see GUIDATA)
449
450 % Hint: get(hObject,'Value') returns toggle state of checkbox1
451
452
453 % --- Executes on button press in checkbox2.
454 function checkbox2_Callback(hObject, eventdata, handles)
455 % hObject    handle to checkbox2 (see GCBO)
456 % eventdata  reserved - to be defined in a future version of MATLAB
457 % handles    structure with handles and user data (see GUIDATA)
458
459 % Hint: get(hObject,'Value') returns toggle state of checkbox2
460
461
462 % --- Executes on button press in checkbox3.
463 function checkbox3_Callback(hObject, eventdata, handles)
464 % hObject    handle to checkbox3 (see GCBO)
465 % eventdata  reserved - to be defined in a future version of MATLAB
466 % handles    structure with handles and user data (see GUIDATA)
467
468 % Hint: get(hObject,'Value') returns toggle state of checkbox3
469
470
471 % --- Executes on button press in pushbutton3.
472 function pushbutton3_Callback(hObject, eventdata, handles)
473 % hObject    handle to pushbutton3 (see GCBO)
474 % eventdata  reserved - to be defined in a future version of MATLAB
475 % handles    structure with handles and user data (see GUIDATA)
476 h0 =
477 figure('toolbar','auto','name','ddmin','NumberTitle','off','menubar','none'
478 );
479 I = imread('select.png');
480 imshow(I);
481 %guidata(hObject, eventdata);
482
483 % --- Executes on selection change in popupmenu4.
484 function popupmenu4_Callback(hObject, eventdata, handles)
```

```
% hObject    handle to popupmenu4 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: contents = cellstr(get(hObject,'String')) returns popupmenu4
contents as cell array
%        contents{get(hObject,'Value')} returns selected item from
popupmenu4
global TYPE Dd1pos Dd1array Dd1 Dd2 Dd2array chuandongbi Vmax;

%obtain belt type, Z-1, A-2, B-3, C-4, D-5, E-6
TYPE = get(handles.popupmenu4,'value');
switch(TYPE)
        case 1
            set(handles.popup,'string','50|63|71|80|75|90');
        case 2
            set(handles.popup,'string','75|90|100|125|140|160');
        case 3
            set(handles.popup,'string','125|140|160|180|200|250');
        case 4
            set(handles.popup,'string','200|250|315|400|450|500');
        case 5
            set(handles.popup,'string','355|400|450|500|560|630');
            Vmax = 30;
        case 6
            set(handles.popup,'string','500|560|630|710');
            Vmax = 30;
end
Dd1pos = get(handles.popup,'value'); %È·¶¨popupÖÐDd1Ñ¡ÔñµÄÎ»ÖÃ
Dd1 = Dd1array((TYPE - 1) * 4 + Dd1pos);
Dd22 = chuandongbi*Dd1;
Dd2 = nearest(Dd22,Dd2array);
a01 = 0.7*(Dd1+Dd2);
a02 = 2*(Dd1+Dd2);
pa1 = num2str(a01);
pa2 = num2str(a02);
set(handles.edit7,'string',pa1);
set(handles.edit8,'string',pa2);

% --- Executes during object creation, after setting all properties.
function popupmenu4_CreateFcn(hObject, eventdata, handles)
% hObject    handle to popupmenu4 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: popupmenu controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end


% --- Executes on selection change in popup.
function popup_Callback(hObject, eventdata, handles)
% hObject    handle to popup (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: contents = cellstr(get(hObject,'String')) returns popup contents
as cell array
```

```
546 %        contents{get(hObject,'Value')} returns selected item from popup
547 global Dd1 TYPE Dd1array Dd1pos Dd2 Dd2array chuandongbi;
548 Dd1pos = get(handles.popup,'value'); %È·¶¨popupÖÐDd1Ñ¡ÔñµÄÎ»ÖÃ
549 Dd1 = Dd1array((TYPE - 1) * 4 + Dd1pos);
550 Dd22 = chuandongbi * Dd1;
551 Dd2 = nearest(Dd22, Dd2array);
552 a01 = 0.7*(Dd1 + Dd2);
553 a02 = 2*(Dd1 + Dd2);
554 pa1 = num2str(a01);
555 pa2 = num2str(a02);
556 set(handles.edit7, 'string', pa1);
557 set(handles.edit8, 'string', pa2);
558
559 % --- Executes during object creation, after setting all properties.
560 function popup_CreateFcn(hObject, eventdata, handles)
561 % hObject    handle to popup (see GCBO)
562 % eventdata  reserved - to be defined in a future version of MATLAB
563 % handles    empty - handles not created until after all CreateFcns called
564
565 % Hint: popupmenu controls usually have a white background on Windows.
566 %       See ISPC and COMPUTER.
567 if ispc && isequal(get(hObject,'BackgroundColor'),
568 get(0,'defaultUicontrolBackgroundColor'))
569     set(hObject,'BackgroundColor','white');
570 end
571
572
573
574 function edit7_Callback(hObject, eventdata, handles)
575 % hObject    handle to edit7 (see GCBO)
576 % eventdata  reserved - to be defined in a future version of MATLAB
577 % handles    structure with handles and user data (see GUIDATA)
578
579 % Hints: get(hObject,'String') returns contents of edit7 as text
580 %        str2double(get(hObject,'String')) returns contents of edit7 as a
581 double
582
583
584 % --- Executes during object creation, after setting all properties.
585 function edit7_CreateFcn(hObject, eventdata, handles)
586 % hObject    handle to edit7 (see GCBO)
587 % eventdata  reserved - to be defined in a future version of MATLAB
588 % handles    empty - handles not created until after all CreateFcns called
589
590 % Hint: edit controls usually have a white background on Windows.
591 %       See ISPC and COMPUTER.
592 if ispc && isequal(get(hObject,'BackgroundColor'),
593 get(0,'defaultUicontrolBackgroundColor'))
594     set(hObject,'BackgroundColor','white');
595 end
596
597
598
599 function edit8_Callback(hObject, eventdata, handles)
600 % hObject    handle to edit8 (see GCBO)
601 % eventdata  reserved - to be defined in a future version of MATLAB
602 % handles    structure with handles and user data (see GUIDATA)
603
604 % Hints: get(hObject,'String') returns contents of edit8 as text
605 %        str2double(get(hObject,'String')) returns contents of edit8 as a
606 double
```

```
607
608
609 % --- Executes during object creation, after setting all properties.
610 function edit8_CreateFcn(hObject, eventdata, handles)
611 % hObject    handle to edit8 (see GCBO)
612 % eventdata  reserved - to be defined in a future version of MATLAB
613 % handles    empty - handles not created until after all CreateFcns called
614
615 % Hint: edit controls usually have a white background on Windows.
616 %       See ISPC and COMPUTER.
617 if ispc && isequal(get(hObject,'BackgroundColor'),
618 get(0,'defaultUicontrolBackgroundColor'))
619     set(hObject,'BackgroundColor','white');
620 end
621
622
623
624 function edit9_Callback(hObject, eventdata, handles)
625 % hObject    handle to edit9 (see GCBO)
626 % eventdata  reserved - to be defined in a future version of MATLAB
627 % handles    structure with handles and user data (see GUIDATA)
628
629 % Hints: get(hObject,'String') returns contents of edit9 as text
630 %        str2double(get(hObject,'String')) returns contents of edit9 as a
631 double
632
633
634 % --- Executes during object creation, after setting all properties.
635 function edit9_CreateFcn(hObject, eventdata, handles)
636 % hObject    handle to edit9 (see GCBO)
637 % eventdata  reserved - to be defined in a future version of MATLAB
638 % handles    empty - handles not created until after all CreateFcns called
639
640 % Hint: edit controls usually have a white background on Windows.
641 %       See ISPC and COMPUTER.
642 if ispc && isequal(get(hObject,'BackgroundColor'),
643 get(0,'defaultUicontrolBackgroundColor'))
644     set(hObject,'BackgroundColor','white');
645 end
646
647
648 % --- Executes on button press in pushbutton4.
649 function pushbutton4_Callback(hObject, eventdata, handles)
650 % hObject    handle to pushbutton4 (see GCBO)
651 % eventdata  reserved - to be defined in a future version of MATLAB
652 % handles    structure with handles and user data (see GUIDATA)
653 global Pd yilei erlei chuandongbi zhuansu TYPE Dd1 Dd2 MINMAX P0array
654 Narray Vmax Ldarray Dd1pos Kaarray Dd2array Klarray TABLEPOS data
655 datafront;
656 clc;
657 for i = 1:1
658 Dd22 = chuandongbi*Dd1;
659 Dd2 = nearest(Dd22,Dd2array);
660 V = pi*Dd1*zhuansu/(60*1000);                              %velocity
661 a0 = str2double(get(handles.edit9,'string'));              %central distance
662 Ldpie = 2*a0 + 1.57*(Dd1 + Dd2) + (Dd2 - Dd1)^2/(4*a0);  %initial Datum
663 length
664 Ld = nearest(Ldpie,Ldarray);                              %final Datum
665 length
666 a = round(a0 + (Ld-Ldpie)/2);                             %final central
667 distance
```

```
668
669 alf1 = 180 - (Dd2 - Dd1)/a*57.3;
670 P0 = P0func(zhuansu,MINMAX,P0array,Narray,TYPE,Dd1pos);
671 Ka = baojiao(alf1,Kaarray);
672 Kl = daichangxiuzheng(Ld,TYPE,Klarray);
673 Kb = wanquyingxiang(TYPE);
674
675 Ki = chuandongbixishu(chuandongbi);
676 dietaP0 = Kb*zhuansu*(1 - 1/Ki);
677 Zfront = Pd/(P0 + dietaP0)/Ka/Kl;
678 Z = ceil(Zfront);
679
680 m = mass(TYPE);
681 if(Z<1)
682     Z=1;
683 end
684     F0=500*Pd/(V*Z)*((2.5-Ka)/Ka)+m*V^2;
685     Fq=2*F0*Z*sin(alf1/360*pi);
686 %update result table
687 data={Z,Ld,a,alf1,V,Dd2,F0,Fq};
688 changetabledsp(handles.uitable1,'write',TABLEPOS,TYPE,data);
689 TABLEPOS = TABLEPOS + 1;
690 end
691
692 % --- Executes on selection change in listbox3.
693 function listbox3_Callback(hObject, eventdata, handles)
694 % hObject    handle to listbox3 (see GCBO)
695 % eventdata  reserved - to be defined in a future version of MATLAB
696 % handles    structure with handles and user data (see GUIDATA)
697
698 % Hints: contents = cellstr(get(hObject,'String')) returns listbox3
699 contents as cell array
700 %        contents{get(hObject,'Value')} returns selected item from listbox3
701
702
703 % --- Executes during object creation, after setting all properties.
704 function listbox3_CreateFcn(hObject, eventdata, handles)
705 % hObject    handle to listbox3 (see GCBO)
706 % eventdata  reserved - to be defined in a future version of MATLAB
707 % handles    empty - handles not created until after all CreateFcns called
708
709 % Hint: listbox controls usually have a white background on Windows.
710 %       See ISPC and COMPUTER.
711 if ispc && isequal(get(hObject,'BackgroundColor'),
712 get(0,'defaultUicontrolBackgroundColor'))
713     set(hObject,'BackgroundColor','white');
714 end
715
716 function Ka = baojiao(alf1,Kaarray)
717 %calculate Small round bag angle
718 [a,b]=lookforpos(alf1,Kaarray(1,:));
719 Ka=interp1([Kaarray(1,a),Kaarray(1,b)],[Kaarray(2,a),Kaarray(2,b)],alf1);
720
721 function changetabledsp(tableh,s,pos,TYPE,data)
722 %update table
723 global DSPcellarray HEADMES;
724
725 switch(TYPE)
726     case 1
727         xingbie = 'Z';
728     case 2
```

```
729         xingbie = 'A';
730     case 3
731         xingbie = 'B';
732     case 4
733         xingbie = 'C';
734     case 5
735         xingbie = 'D';
736     case 6
737         xingbie = 'E';
738 end
739 
740 switch(s)
741     case 'deleteall'
742         DSPcellarray = initcell();
743     case 'write'
744         DSPcellarray = write(DSPcellarray,pos,xingbie,data);
745 end
746 
747 DSP={
748 DSPcellarray{1}{1:end};
749 DSPcellarray{2}{1:end};
750 DSPcellarray{3}{1:end};
751 DSPcellarray{4}{1:end};
752 DSPcellarray{5}{1:end};
753 DSPcellarray{6}{1:end};
754 DSPcellarray{7}{1:end};
755 DSPcellarray{8}{1:end};
756 DSPcellarray{9}{1:end};
757 DSPcellarray{10}{1:end};
758      };
759 set(tableh,'data',DSP);
760 
761 DSQ={
762 1 DSPcellarray{1}{1:end};
763 2 DSPcellarray{2}{1:end};
764 3 DSPcellarray{3}{1:end};
765 4 DSPcellarray{4}{1:end};
766 5 DSPcellarray{5}{1:end};
767 6 DSPcellarray{6}{1:end};
768 7 DSPcellarray{7}{1:end};
769 8 DSPcellarray{8}{1:end};
770 9 DSPcellarray{9}{1:end};
771 10 DSPcellarray{10}{1:end};
772 };
773 
774 function DSP = write(DSParray,pos,xingbie,data)
775 %write data into the table
776 DSParray{pos} = {xingbie data{1:end}};
777 DSP=DSParray;
778 
779 function DSPce = initcell()
780 %Initialize the cell array used to display the table
781 for i = 1:10
782     dsp{i} = {'',[],[],[],[],[],[],[],[]};
783 end
784 DSPce = dsp;
785 
786 function Ki = chuandongbixishu(chuandongbi)
787 %find Ki
788 i = chuandongbi;
789 if(i >= 1 && i < 1.01)
```

```
790     Ki = 1;
791     elseif(i >= 1.01 && i < 1.04)
792         Ki = 1.0136;
793     elseif(i >= 1.04 && i < 1.08)
794         Ki = 1.0276;
795     elseif(i >= 1.08 && i < 1.12)
796         Ki = 1.0419;
797     elseif(i >= 1.12 && i < 1.18)
798         Ki = 1.0567;
799     elseif(i >= 1.18 && i < 1.24)
800         Ki = 1.0719;
801     elseif(i >=1.24 && i < 1.34)
802         Ki = 1.0875;
803     elseif(i >= 1.34 && i < 1.51)
804         Ki = 1.1036;
805     elseif(i >= 1.51 && i < 1.99)
806         Ki = 1.1202;
807     elseif(i >= 1.99)
808         Ki = 1.1373;
809 end
810
811 function Kl = daichangxiuzheng(Ld,TYPE,Klarray)
812 %fix the length of belt
813 p = find(Klarray(:,1) == Ld);
814 Kl=Klarray(p,(TYPE+1));
815
816 function [a,b]=lookforpos(k,shuzu)
817 %Used to find which two numbers of an array are sandwiched between
818 %If not found, a and b are -1
819 a1 = find(shuzu >= k);
820 a2 = find(shuzu <= k);
821 if(isempty(a1) || isempty(a2))
822     a = -1;
823     b = -1;
824 else
825     a = a1(1);%Note: Just locate, not the number of locations
826     b = a2(end);
827     if(abs(a - b) > 1)
828         a = a1(end);
829         b = a2(1);
830     end
831 end
832
833 function m = mass(TYPE)
834 %Calculate band quality
835 p = [0.06,0.1,0.17,0.3,0.6,0.9];
836 m = p(TYPE);
837
838 function back = nearest(a,p)
839 %Find the closest value to a in the array p, and assign it to back
840 pp = p - a.*ones(size(p));
841 k = find(abs(pp) == min(abs(pp)));
842 %Note that when the difference between the two values is the same here,
843 %the number at the top of P is chosen according to the order of
844 arrangement.
845 back=p(k(1));
846
847 function P0=P0func(zhuansu,minmax,P0array,Narray,TYPE,Dd1pos)
848 %Used to find rated power P0 in the table, if not found, return to - 1;
849 %The above data correspond to the global variable names in the GUI
850 weizhix=(TYPE-1)*4+Dd1pos;
```

```
851 if(zhuansu > minmax(weizhix,2) || zhuansu < minmax(weizhix,1))
852     P0 = -1;
853 else
854     [a,b] = lookforpos(zhuansu,Narray);
855     P0 =
856 interp1([Narray(a),Narray(b)],[P0array(weizhix,a),P0array(weizhix,b)],zhuan
857 su);
858 end
859
860 function plotline(a,b,s,area)
861 %Draw a straight line according to two points [a, b].
862 %Area is the range of independent variables.
863 %If there is no range of input variables,
864 %the default values a and B are endpoint coordinates, respectively.
865 if(a(1) > b(1))
866    c = a;
867    a = b;
868    b = c;
869 end
870 if(nargin == 2)
871     s = '-';
872     area = [a(1),b(1)];
873 end
874 if(nargin == 3)
875     area = [a(1),b(1)];
876 end
877 p = polyfit([a(1),b(1)],[a(2),b(2)],1);
878 x = linspace(area(1),area(2),ceil((b(1)-a(1))*500));
879 x1 = log(x);
880 y = polyval(p,x);
881 plot(x1,y,s);
882
883 function Kb = wanquyingxiang(TYPE)
884 %find Kb
885 table = [0.2915 0.7725 1.9875 5.625 19.95 37.35]/1000;
886 Kb = table(TYPE);
887
888 %--------------------------------------------------------------------
889 %------------------------------end-----------------------------------
890 %--------------------------------------------------------------------
891
```

五、程序运行结果

(1) 第一步，打开程序界面，如图 2 所示，程序的名称为 VBC，其具体含义是：V-Belt Calculation。

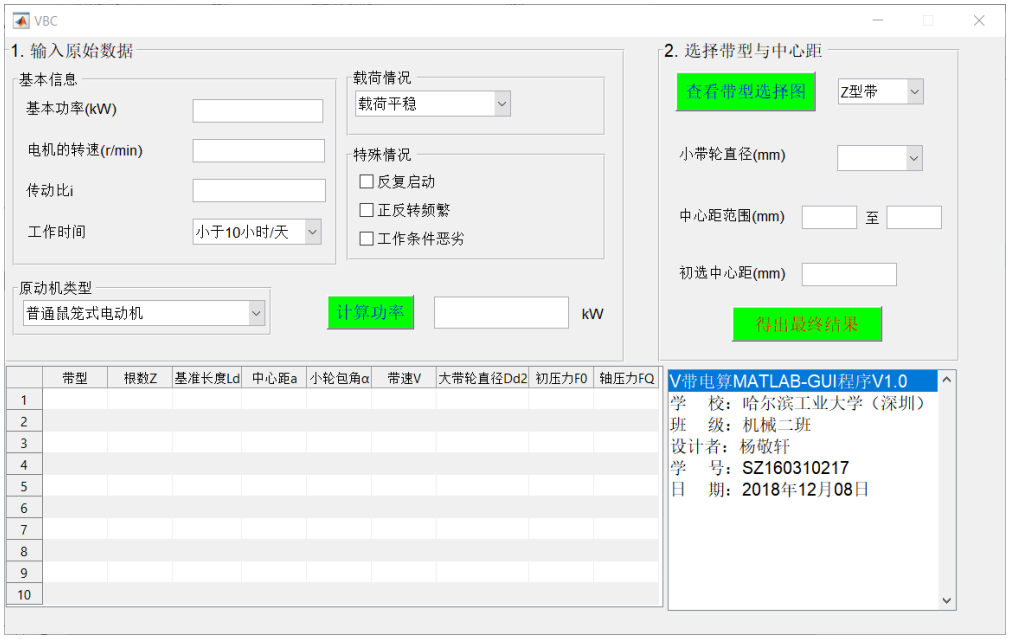

图 2 程序初始界面

(2) 第二步，输入基本功率，电机转速，传动比，工作时间，原动机类型，载荷情况以及特殊情况，点击计算功率，得到设计功率，如图 3 所示。

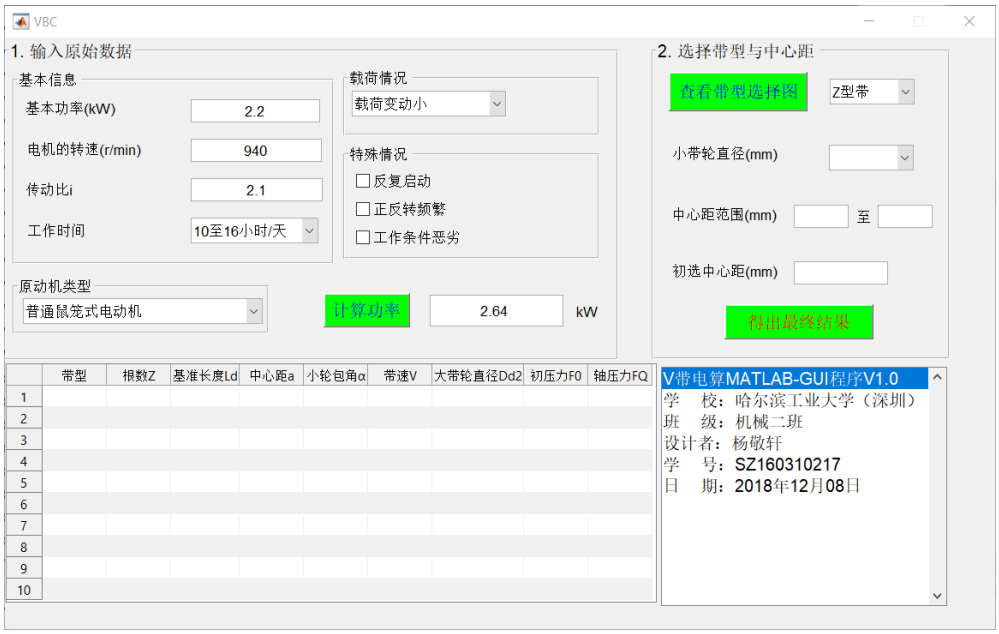

图 3 程序运行第二步

(3) 第三步，点击查看带型选择图，则会弹出选型图片，如图 4 所示。选好带型后，关闭图片，将带型输入程序，程序自动匹配可供选择的小带轮直径，可以直接点选小带轮直径，如图 5 所示。

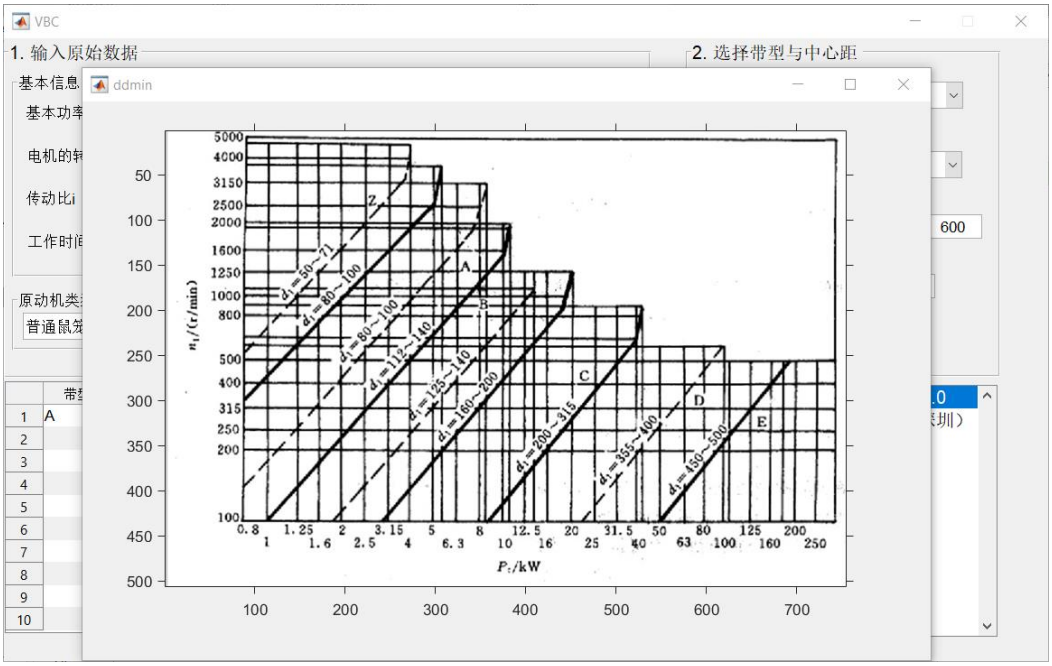

图 4　程序运行第三步(a)

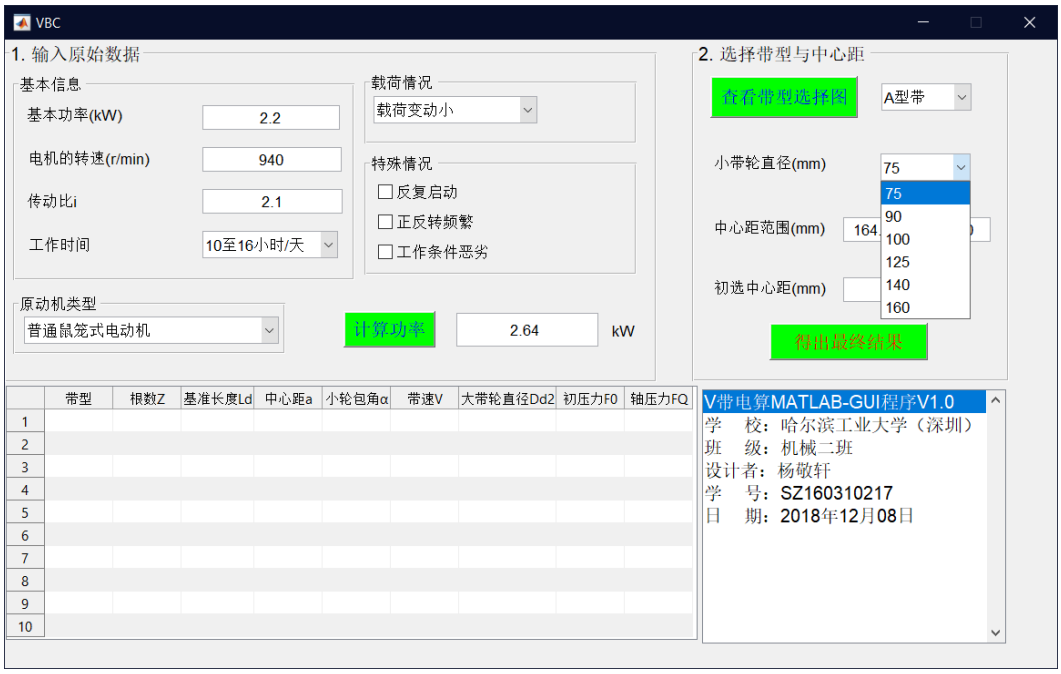

图 5　程序运行第三步(b)

(4) 第四步，选好小带轮直径后，程序自动计算出中心距范围，在此范围选择合适的中心距输入程序，点击“得出最终结果”，则可以在程序左下方显示小带轮的各个参数，如图 6 所示。经检验，与大作业三手动计算的出的结果一致。

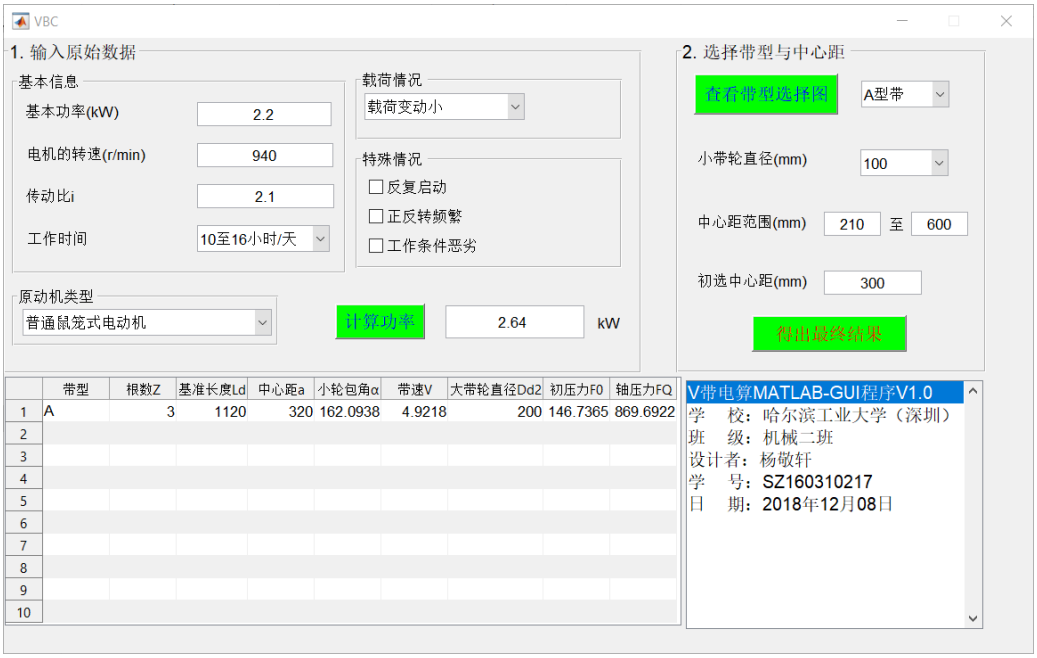

图 6 程序运行第四步

(5) 第五步， 如果对初选结果不满意，可以随时更改任何参数，程序会自动重新进行运算，点击“得出最后结果”，就可以将结果输出在左下方的表格里，一次最多可以输出十组数据以供选择。运行示例如图 7 所示。

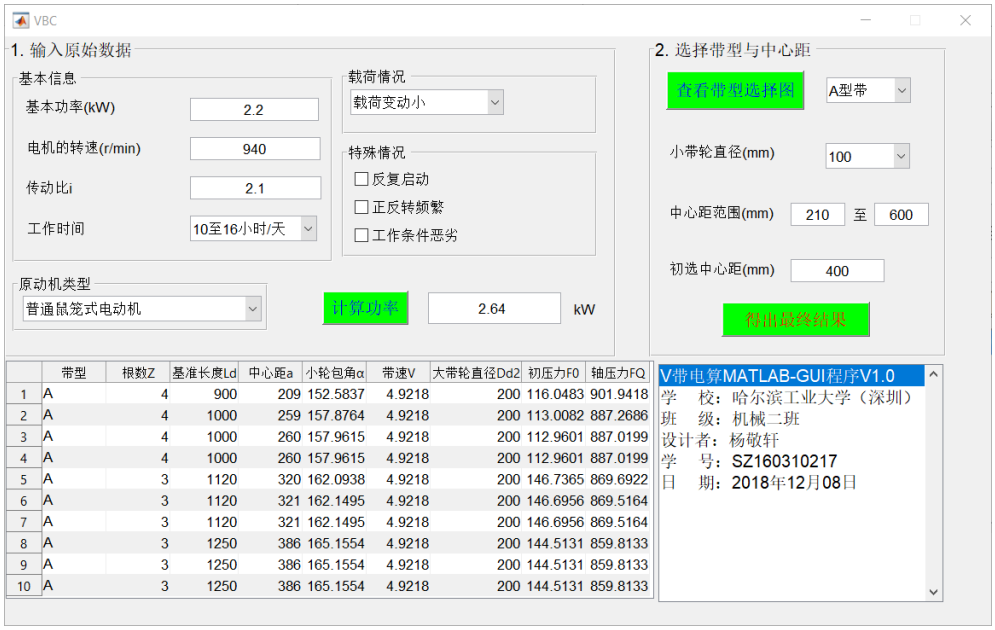

图 7 程序运行第五步

六、总结

本次V带电算是一个综合性很强的任务，既需要对V带的设计过程了如指掌，也需要有比较强的编程能力。我从这次完整的电算训练中收获很大，不仅强化了对V带的设计过程中各个细节的理解，而且提升了编程实践能力，初步了解了MATLAB的GUI编程的概念与实现过程，这对将来解决工作中、科研中遇到的实际问题大有裨益。

七、参考文献

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