

# principium



# Evaluating G-Code and Programs

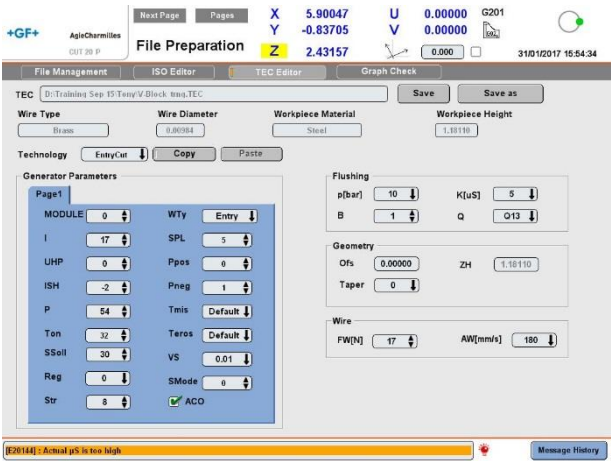
The Erosion process

**Items in this presentation can be referenced in the  
AgieCharmilles operator training manual**

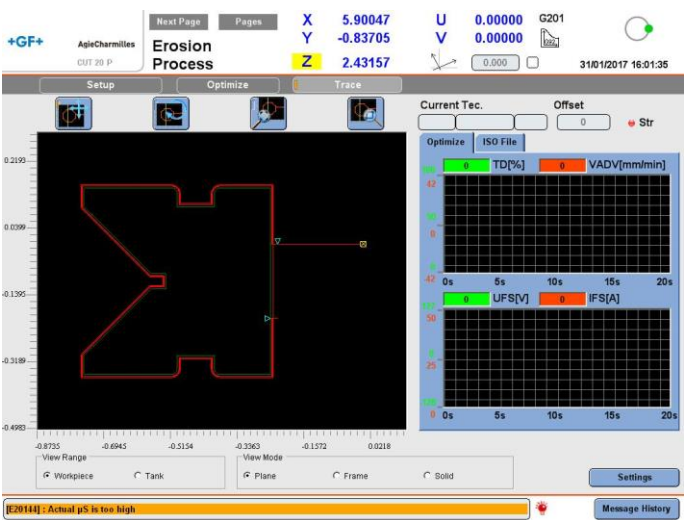
**Section:** user interface

**Pages 5 and 6**

# Erosion Process



## Wire EDM Module 4.11 Evaluating G-Code



Once an ISO program and a TEC program have been created, the user can evaluate and test the code before running the program

ISO and TEC  
files selected

Next PagePagesX5.90047Y-0.83705Z2.43157UV0.000000.00000G2010.00031/01/2017 15:59:47

+GF+AgieCharmillesCUT 20 PErosion Process

SetupOptimizeTrace

ISO: D:\Training Sep 15\Tony\VBLOCK-4PASS.ISO

TEC: D:\Training Sep 15\Tony\V-Block\_trng.TEC

File Preparation

D:

FOUND.000

FOUND.001

BACTEST

PCD

Training Sep 15

Tony

CAM-EASY PRACT

CCD-THREADING DEI

JOB1

award file

Award 12-7-17

CLAMP-1

V-Block\_trng

Start Erosion Time

7/17/20083:59:31 PM

Manual Erosion

Wire Break Strategy

Dry

Block

M01

0.00000

SettingsCut Limit

Scale1.000

Workpiece Height0.00000

CLE-0.00015

Main Program Plane0.00000

Rotation0.000

X MirrorY MirrorX-Y Exchange

[E20144] : Actual µS is too high

Message History

This presentation will address some areas of G-Code in an ISO program to evaluate against the TEC file

- The evaluation of the G-Code should be performed methodically
- The CNC controller of the Agie Charmille Wire EDM will help with some of the evaluation
- Dry run should be utilized when possible
- The user should also be aware of the fixtures in the machine as well as the Z axis location

\* For this section of the Power Point Presentation the students should have the ISO file for the V-block open on the computer or printed out to read

# \* Evaluate offsets

Look at the first eight (8) lines of the ISO program for the V-block below. Take note of how many offset callouts there are and the value of each offset

<u>What the code reads</u>	<u>What the code means</u>
1) G20;	1) Program in inches
2) H000 = 0;	2) Offset of zero inches
3) H001 = 0.00872;	3) This offset = 0.00872;
4) H002 = 0.00642;	4) This offset = 0.00642;
5) H003 = 0.00527;	5) This offset = 0.00527;
6) H004 = 0.00508;	6) This offset = 0.00508;
7) ( ) (VBLOCK 4PASS);	7) Readable block;
8) G90 G92 X0 Y0;	8) Absolute movement, set as zero point;

Action – compare the number of offsets in the program:

- The number of offsets
- The value of the offsets

## \* Evaluate offsets

How many offsets are  
in the ISO program

How many Cuts are in  
the TEC file

### What the code reads

- 1) G20;
- 2) H000 = 0;
- 3) H001 = 0.00872;
- 4) H002 = 0.00642;
- 5) H003 = 0.00527;
- 6) H004 = 0.00508;
- 7) ( ) (VBLOCK 4PASS);
- 8) G90 G92 X0 Y0;

The screenshot shows the TEC editor interface with the following details:

- Top Bar:** Includes 'Next Page', 'Pages', and coordinate values: X 7.82890, Y 0.00000, Z 0.99028. It also shows 'U 0.00000', 'V 0.00000', 'G20', and a date/time stamp '16/03/2017 20:30:01'.
- File Management:** Shows 'File Preparation' and a file path 'D:\Training Sep 15\Tony\VBLOCK trng.TEC'.
- Wire Type:** Set to 'Brass'.
- Wire Diameter:** Set to '0.00984'.
- Workpiece Material:** Set to 'Steel'.
- Workpiece Height:** Set to '1.18110'.
- Technology:** A dropdown menu is open, showing options: 'EntryCut', 'ExitCut', 'BrokenCut', 'MainCut', 'TrimCut1', 'TrimCut2', and 'TrimCut3'. 'EntryCut' is selected.
- Parameters:** A table of parameters is visible, including 'I 17', 'UHP 0', 'ISH -2', 'P 54', 'Ton 32', 'SSoll 30', 'Reg 0', 'Str 8', 'SPL 5', 'Ppos 0', 'Pneg 1', 'Tmis Default', 'Teros Default', 'VS 0.01', 'SMode 0', and 'ACO' (checked).
- Flushing:** Parameters include 'p[bar] 10', 'K[uS] 5', 'B 1', and 'Q Q13'.
- Geometry:** Parameters include 'Ofs 0.00000', 'ZH 1.18110', and 'Taper 0'.
- Wire:** Parameters include 'FW[N] 17' and 'AW[mm/s] 180'.
- Buttons:** 'Save' and 'Save as' buttons are present.
- Message History:** A button labeled 'Message History' is at the bottom right.

Screen shot of the TEC file in the TEC editor



## Look at a truncated version of the ISO G-Code Are the Offsets utilized?

M60; (ROUGH PRIMARY CUT VBLOCK 4PASS); G90 G92 X0 Y0; C096; G01 X-.1 Y0; C001; G42 H000; G01 X-.25 Y0; G42 H001; ← <u>Offset 1</u> G01 X-.25 Y.15; G01 X-.385 Y.15; G03 X-.4 Y.135 I0 J-.015; G01 X-.4 Y.1; G01 X-.5 Y.1; G01 X-.5 Y.135; . . . C097; G40 H000 G50 A0 G01 X-.23 Y-.2; . . .	(SKIM PRIMARY CUT [ 1 ] VBLOCK 4PASS); G90 G92 X-.23 Y-.2; C002; G41 H000; G01 X-.25 Y-.2; G41 H002; ← <u>Offset 2</u> G01 X-.25 Y-.35; G01 X-.385 Y-.35; G02 X-.4 Y-.335 I0 J.015; G01 X-.4 Y-.3; G01 X-.5 Y-.3; G01 X-.5 Y-.335; G02 X-.515 Y-.35 I-.015 J0; . . . G40 H000 G50 A0 G01 X-.23 Y0; . . .	(SKIM PRIMARY CUT [ 2 ] VBLOCK 4PASS); G90 G92 X-.23 Y0; C003; G42 H000; G01 X-.25 Y0; G42 H003; ← <u>Offset 3</u> G01 X-.25 Y.15; G01 X-.385 Y.15; G03 X-.4 Y.135 I0 J-.015; G01 X-.4 Y.1; G01 X-.5 Y.1; G01 X-.5 Y.135; . . . G40 H000 G50 A0 G01 X-.23 Y-.2; . . .	(SKIM PRIMARY CUT [ 3 ] VBLOCK 4PASS); G90 G92 X-.23 Y-.2; C004; G41 H000; G01 X-.25 Y-.2; G41 H004; ← <u>Offset 4</u> G01 X-.25 Y-.35; G01 X-.385 Y-.35; G02 X-.4 Y-.335 I0 J.015; G01 X-.4 Y-.3; G01 X-.5 Y-.3; . . G40 H000 G50 A0 G01 X-.23 Y0; . . .
--	--	--	--

Offset (0) is used to cancel the offsets



\* Evaluate cuts

How many Cuts are in the TEC file



Next Page Pages X 7.82890 U 0.00000 G202  
Y 0.00000 V 0.00000  
Z 0.99028 0.000 16/03/2017 20:30:01

+GF+ AgieCharmilles CUT 20 P File Preparation

File Management ISO Editor TEC Editor Graph Check

TEC D:\Training Sep 15\Tony\V-Block trng.TEC Save Save as

Wire Type Brass Wire Diameter 0.00984 Workpiece Material Steel Workpiece Height 1.18110

Technology EntryCut Copy Paste

EntryCut  
ExitCut  
BrokenCut  
MainCut  
TrimCut1  
TrimCut2  
TrimCut3

MODULE

I 17 UHP 0 ISH -2 P 54 Ton 32 SSoll 30 Reg 0 Str 8

Wty Entry SPL 5 Ppos 0 Pneg 1 Tmis Default Teros Default VS 0.01 SMode 0 ACO

Flushing p[bar] 10 K[uS] 5 B 1 Q Q13

Geometry Ofs 0.00000 ZH 1.18110 Taper 0

Wire FW[N] 17 AW[mm/s] 180

Message History

Screen shot of the TEC file in the TEC editor

How many Cuts are in the ISO G-Code

## Look at a truncated version of the ISO G-Code How many cuts are in the program?

M60; (ROUGH PRIMARY CUT VBLOCK 4PASS); G90 G92 X0 Y0; C096; G01 X-.1 Y0; C001; ← <u>Cut 1</u> G42 H000; G01 X-.25 Y0; G42 H001; G01 X-.25 Y.15; G01 X-.385 Y.15; G03 X-.4 Y.135 I0 J-.015; G01 X-.4 Y.1; G01 X-.5 Y.1; G01 X-.5 Y.135; . . . C097; G40 H000 G50 A0 G01 X-.23 Y-.2; . . .	(SKIM PRIMARY CUT [ 1] VBLOCK 4PASS); G90 G92 X-.23 Y-.2; C002; ← <u>Cut 2</u> G41 H000; G01 X-.25 Y-.2; G41 H002; G01 X-.25 Y-.35; G01 X-.385 Y-.35; G02 X-.4 Y-.335 I0 J.015; G01 X-.4 Y-.3; G01 X-.5 Y-.3; G01 X-.5 Y-.335; G02 X-.515 Y-.35 I-.015 J0; . . . G40 H000 G50 A0 G01 X-.23 Y0; . . .	(SKIM PRIMARY CUT [ 2] VBLOCK 4PASS); G90 G92 X-.23 Y0; C003; ← <u>Cut 3</u> G42 H000; G01 X-.25 Y0; G42 H003; G01 X-.25 Y.15; G01 X-.385 Y.15; G03 X-.4 Y.135 I0 J-.015; G01 X-.4 Y.1; G01 X-.5 Y.1; G01 X-.5 Y.135; . . . G40 H000 G50 A0 G01 X-.23 Y-.2; . . .	(SKIM PRIMARY CUT [ 3] VBLOCK 4PASS); G90 G92 X-.23 Y-.2; C004; ← <u>Cut 4</u> G41 H000; G01 X-.25 Y-.2; G41 H004; G01 X-.25 Y-.35; G01 X-.385 Y-.35; G02 X-.4 Y-.335 I0 J.015; G01 X-.4 Y-.3; G01 X-.5 Y-.3; . . G40 H000 G50 A0 G01 X-.23 Y0; . . .
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Each cut corresponds with the TEC file:

- Cut 1 = Main cut
- Cut 2 = Trim cut 1
- Cut 3 = Trim cut 2
- Cut 4 = Trim cut 3

\* Evaluate cuts

How many Cuts are in  
the TEC file



Next Page Pages X 7.82890 U 0.00000 G202  
Y 0.00000 V 0.00000  
Z 0.99028 0.000 16/03/2017 20:30:01

+GF+ AgieCharmilles CUT 20 P File Preparation

File Management ISO Editor TEC Editor Graph Check

TEC D:\Training Sep 15\Tony\V-Block trng.TEC Save Save as

Wire Type Brass Wire Diameter 0.00984 Workpiece Material Steel Workpiece Height 1.18110

Technology EntryCut Copy Paste

EntryCut  
ExitCut  
BrokenCut  
MainCut  
TrimCut1  
TrimCut2  
TrimCut3

Wty Entry  
SPL 5  
Ppos 0  
Pneg 1  
Tmis Default  
Teros Default  
VS 0.01  
SMode 0  
ACO

Flushing  
p[bar] 10 K[uS] 5  
B 1 Q Q13

Geometry  
Ofs 0.00000 ZH 1.18110  
Taper 0

Wire  
FW[N] 17 AW[mm/s] 180

Message History

Screen shot of the TEC file in the TEC editor

- Cut 1 = Main cut
- Cut 2 = Trim cut 1
- Cut 3 = Trim cut 2
- Cut 4 = Trim cut 3

## \* Evaluate cuts

In addition to the Main cut and trims cuts, this G-code program also contains the cut condition for the 'entry cuts' and 'exit cuts'

The screenshot shows the TEC editor interface with the following parameters:

- Wire Type:** Brass
- Wire Diameter:** 0.00984
- Workpiece Material:** Steel
- Workpiece Height:** 1.18110
- Technology:** EntryCut (highlighted in the dropdown menu)
- Generator File:** EntryCut
- Module:** MODULE1
- Parameters:**
  - I: 17
  - UHP: 0
  - ISH: -2
  - P: 54
  - Ton: 32
  - SSoll: 30
  - Reg: 0
  - Str: 8
  - WTy: Entry
  - SPL: 5
  - Ppos: 0
  - Pneg: 1
  - Tmis: Default
  - Teros: Default
  - VS: 0.01
  - SMode: 0
  - ACO: ☒
- Flushing:**
  - p[bar]: 10
  - B: 1
  - K[uS]: 5
  - Q: Q13
- Geometry:**
  - Ofs: 0.00000
  - Taper: 0
  - ZH: 1.18110
- Wire:**
  - FW[N]: 17
  - AW[mm/s]: 180

Buttons: Next Page, Pages, Save, Save as, Message History

Screen shot of the TEC file in the TEC editor

Entry Cut = C096

Exit Cut = C097

## \* Evaluate G- codes

```
G20; ← G20  
H000 = 0;  
H001 = 0.00872;  
H002 = 0.00642;  
H003 = 0.00527;  
H004 = 0.00508;  
( ) (VBLOCK 4PASS);  
G90 G92 X0 Y0;  
M60;  
(ROUGH PRIMARY CUT VBLOCK 4PASS);  
G90 G92 X0 Y0; ← G90 / G92  
C096;  
G01 X-.1 Y0;  
C001;  
.  
.  
.
```

```
.  
.  
.  
M01;  
(CUT-OFF PRIMARY CUT VBLOCK 4PASS);  
G90 G92 X-.23 Y0; ← G90 / G92  
C097;  
G41 H000;  
G01 X-.25 Y0;  
G41 H001;  
G01 X-.25 Y-.2;  
M01;  
G40 H000 G50 A0 G01 X-.23 Y-.2;  
M50;  
M02; . . . .
```

Know your important G-code and what these codes produce in the program:

- G20 – program in inches
- G90 or G91 Absolute or incremental programming
- G92 Set coordinate value for current point

## \* Evaluate Special codes / M - codes

```
G20;  
H000 = 0;  
H001 = 0.00872;  
H002 = 0.00642;  
H003 = 0.00527;  
H004 = 0.00508;  
( ) (VBLOCK 4PASS);  
G90 G92 X0 Y0;  
M60; ← Auto thread wire  
(ROUGH PRIMARY CUT VBLOCK 4PASS);  
G90 G92 X0 Y0;  
C096;  
G01 X-.1 Y0;  
C001;  
.  
.  
.
```

```
.  
.  
.  
M01; ← Optional stop  
(CUT-OFF PRIMARY CUT VBLOCK 4PASS);  
G90 G92 X-.23 Y0;  
C097;  
G41 H000;  
G01 X-.25 Y0;  
G41 H001;  
G01 X-.25 Y-.2;  
M01;  
G40 H000 G50 A0 G01 X-.23 Y-.2;  
M50; ← Auto cut wire  
M02; . ← End program
```

Systematically search for any special codes or M code functions. These may include:

- Program stop
- Optional program stop
- Auto thread wire
- Auto cut wire
- Program end

\* Evaluate cut parameters

In addition to the ISO file, compare the parameters for each cut in the TEC file

AgieCharmilles  
CUT 20 P

Next Page Pages X 7.82890 U 0.00000 G202  
Y 0.00000 V 0.00000  
Z 0.99028 0.000 16/03/2017 20:32:48

File Management ISO Editor TEC Editor Graph Check

TEC D:\Training Sep 15\Tony\V-Block trng.TEC Save Save as

Wire Type Wire Diameter Workpiece Material Workpiece Height  
Brass 0.00984 Steel 1.18110

Technology MainCut Copy Paste

Generator Parameters

Page1

MODULE	0	WTy	Main
I	17	SPL	5
UHP	0	Ppos	0
ISH	-2	Pneg	1
P	54	Tmis	Default
Ton	32	Teros	Default
SSoll	30	VS	0.01
Reg	0	SMode	0
Str	0		<input checked="" type="checkbox"/> ACO

Flushing

p[bar]	10	K[uS]	5
B	1	Q	Q13

Geometry

Ofs	0.00876	ZH	1.18110
Taper	0		

Wire

FW[N]	17	AW[mm/s]	180
-------	----	----------	-----

Message History

Screen shot of the TEC file in the TEC editor



\* Evaluate cut parameters

Look at what can be found in the TEC file and compared to the G-code

Which Cut (Main) →

Wire type  
Wire diameter  
Workpiece material  
Workpiece height

Screen shot of the TEC file in the TEC editor

Offset value

Taper value

Next Page Pages X 7.82890 U 0.00000 G202  
Y 0.00000 V 0.00000  
Z 0.99028 0.000 16/03/2017 20:32:48

+GF+ AgieCharmilles CUT 20 P

File Management ISO Editor TEC Editor Graph Check

TEC D:\Training Sep 15\Tony\V-Block.dwg.TEC Save Save as

Wire Type Wire Diameter Workpiece Material Workpiece Height

Brass 0.00984 Steel 1.18110

Technology MainCut Copy Paste

Generator Parameters

Page1

MODULE 0 WTy Main

I 17 SPL 5

UHP 0 Ppos 0

ISH -2 Pneg 1

P 54 Tmis Default

Ton 32 Teros Default

SSoll 30 VS 0.01

Reg 0 SMode 0

Str 0 ACO

Flushing

p[bar] 10 K[uS] 5

B 1 Q Q13

Geometry

Ofs 0.00876 ZH 1.18110

Taper 0

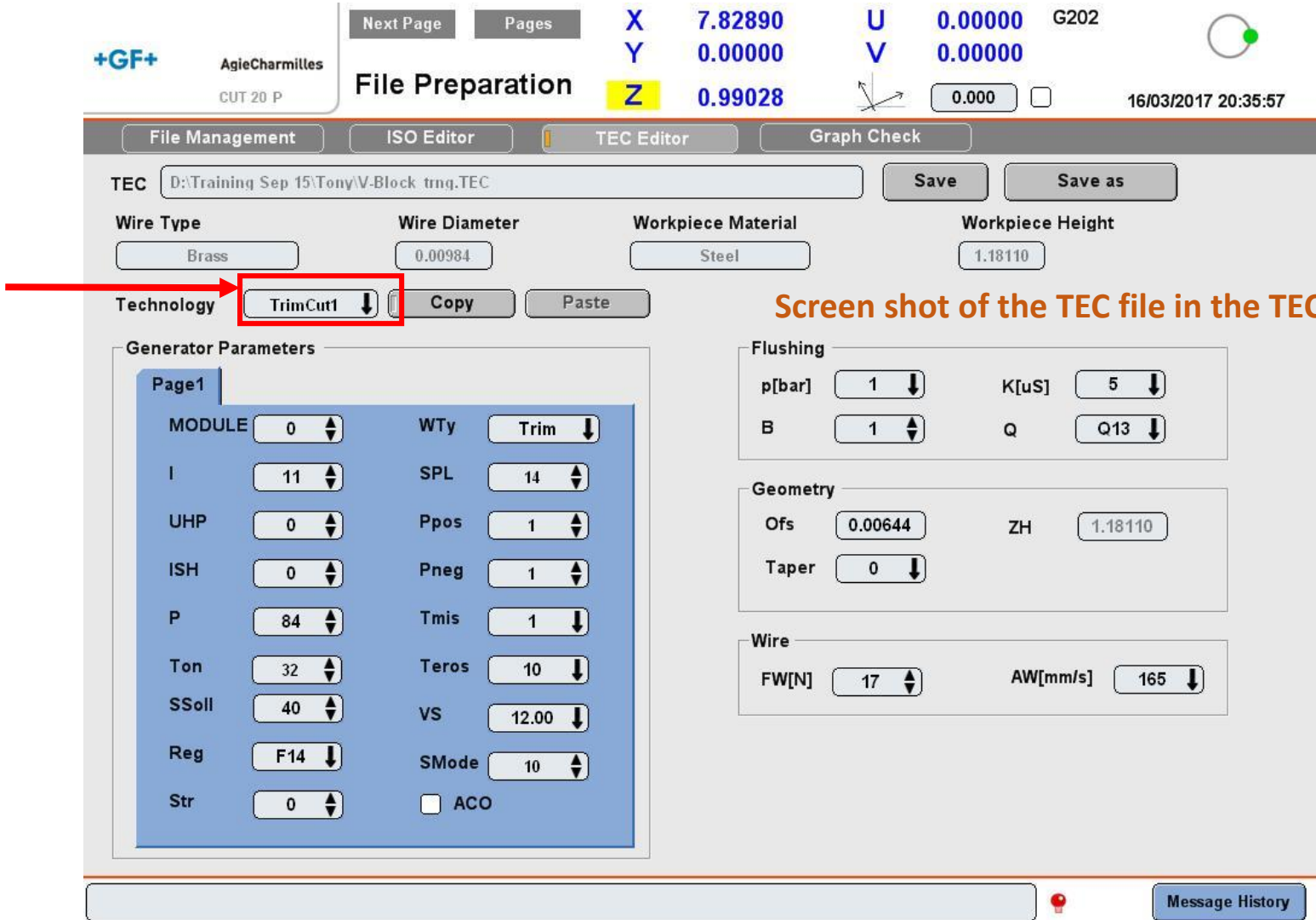
Wire

FW[N] 17 AW[mm/s] 180

Message History

\* Evaluate cuts

In addition to the ISO file, compare the parameters for each cut in the TEC file



Screen shot of the TEC file in the TEC editor

\* Evaluate cuts

In addition to the ISO file, compare the parameters for each cut in the TEC file

Next Page Pages X 7.82890 U 0.00000 G202  
Y 0.00000 V 0.00000  
Z 0.99028 0.000 16/03/2017 20:36:38

+GF+ AgieCharmilles CUT 20 P File Preparation

File Management ISO Editor TEC Editor Graph Check

TEC D:\Training Sep 15\Tony\V-Block trng.TEC Save Save as

Wire Type Wire Diameter Workpiece Material Workpiece Height  
Brass 0.00984 Steel 1.18110

Technology TrimCut2 Copy Paste

Generator Parameters

Page1

MODULE	30	WTy	Trim
I	3	SPL	0
UHP	6	Ppos	1
ISH	0	Pneg	1
P	0	Tmis	1
Ton	0	Teros	10
SSoll	50	VS	7.75
Reg	F13	SMode	10
Str	0	ACO	<input type="checkbox"/>

Flushing

p[bar]	0.3	K[uS]	5
B	1	Q	Q13

Geometry

Ofs	0.00528	ZH	1.18110
Taper	0		

Wire

FW[N]	17	AW[mm/s]	150
-------	----	----------	-----

Message History

Screen shot of the TEC file in the TEC editor

\* Evaluate cuts

In addition to the ISO file, compare the parameters for each cut in the TEC file

Next Page

Pages

X7.82890

Y0.00000

Z0.99028

U0.00000

V0.00000

W0.00000

G202

0.000

16/03/2017 20:37:11

+GF+

AgieCharmilles

CUT 20 P

File Preparation

File Management

ISO Editor

TEC Editor

Graph Check

TEC

D:\Training Sep 15\Tony\V-Block trng.TEC

Save

Save as

Wire Type

Brass

Wire Diameter

0.00984

Workpiece Material

Steel

Workpiece Height

1.18110

Technology

TrimCut3

Copy

Paste

Generator Parameters

Page1

MODULE30

WTyTrim

I3

SPL0

UHP2

Ppos1

ISH0

Pneg1

P0

Tmis1

Ton0

Teros10

SSoll50

VS4.00

RegF12

SMode10

Str0

ACO

Flushing

p[bar]0.3

K[uS]5

B1

QQ13

Geometry

Ofs0.00508

ZH1.18110

Taper0

Wire

FW[N]17

AW[mm/s]135

Message History

\* Evaluate cut parameters

Compare side by side the Entry and Exit cut parameters

**+GF+** AgieCharmilles CUT 20 P

Next Page Pages X 7.82890 U 0.00000 G202  
Y 0.00000 V 0.00000  
Z 0.99028 0.000 16/03/2017 20:30:56

File Management ISO Editor **TEC Editor** Graph Check

TEC D:\Training Sep 15\Tony\V-Block trng.TEC Save Save as

Wire Type Brass Wire Diameter 0.00984 Workpiece Material Steel Workpiece Height 1.18110

Technology **EntryCut** Copy Paste

Generator Parameters

Page1

MODULE	0	WTy	Entry
I	17	SPL	5
UHP	0	Ppos	0
ISH	-2	Pneg	1
P	54	Tmis	Default
Ton	32	Teros	Default
SSoll	30	VS	0.01
Reg	0	SMode	0
Str	8		<input checked="" type="checkbox"/> ACO

Flushing

p[bar] 10 K[uS] 5  
B 1 Q Q13

Geometry

Ofs 0.00000 ZH 1.18110  
Taper 0

Wire

FW[N] 17 AW[mm/s] 180

Message History

**+GF+** AgieCharmilles CUT 20 P

Next Page Pages X 7.82890 U 0.00000 G202  
Y 0.00000 V 0.00000  
Z 0.99028 0.000 16/03/2017 20:31:34

File Management ISO Editor **TEC Editor** Graph Check

TEC D:\Training Sep 15\Tony\V-Block trng.TEC Save Save as

Wire Type Brass Wire Diameter 0.00984 Workpiece Material Steel Workpiece Height 1.18110

Technology **ExitCut** Copy Paste

Generator Parameters

Page1

MODULE	0	WTy	Exit
I	17	SPL	5
UHP	0	Ppos	0
ISH	-2	Pneg	1
P	54	Tmis	Default
Ton	32	Teros	Default
SSoll	30	VS	0.01
Reg	0	SMode	0
Str	8		<input checked="" type="checkbox"/> ACO

Flushing

p[bar] 10 K[uS] 5  
B 1 Q Q13

Geometry

Ofs 0.00000 ZH 1.18110  
Taper 0

Wire

FW[N] 17 AW[mm/s] 180

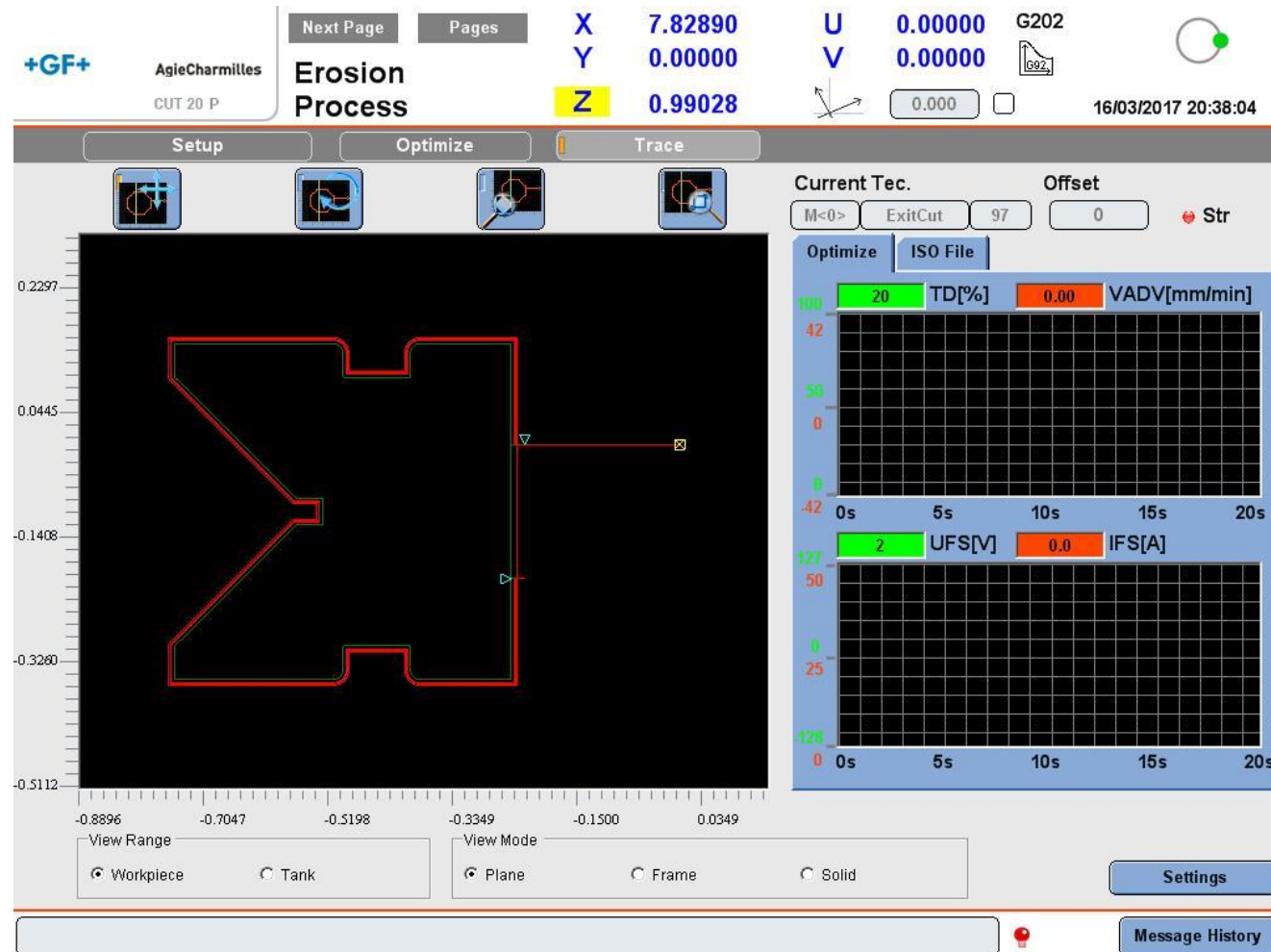
Message History

Screen shot of the TEC file in the TEC editor



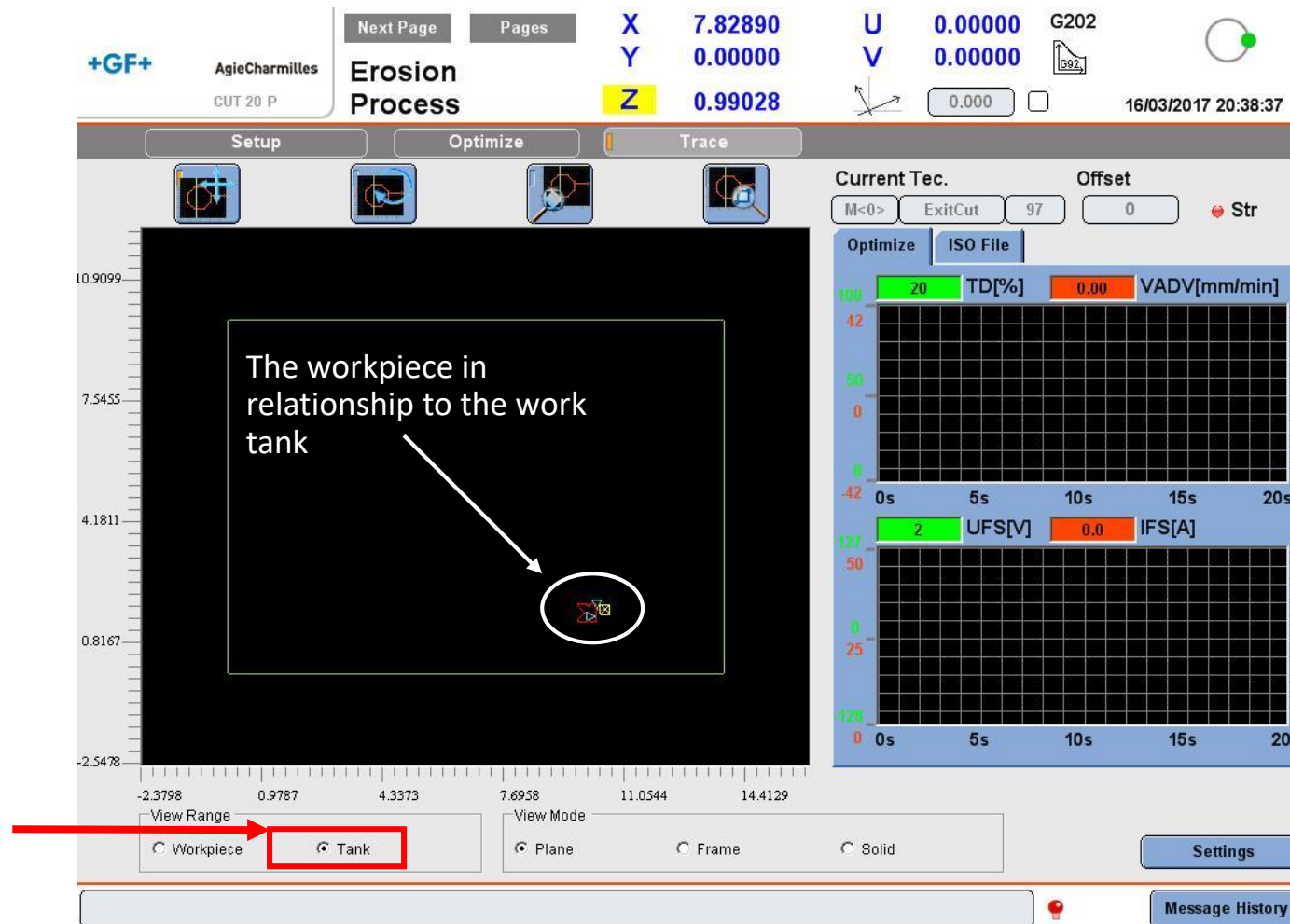
## \* Evaluate part and code

As noted in previous presentations, the trace function will show the part cut with all of the passes



## \* Evaluate part and code

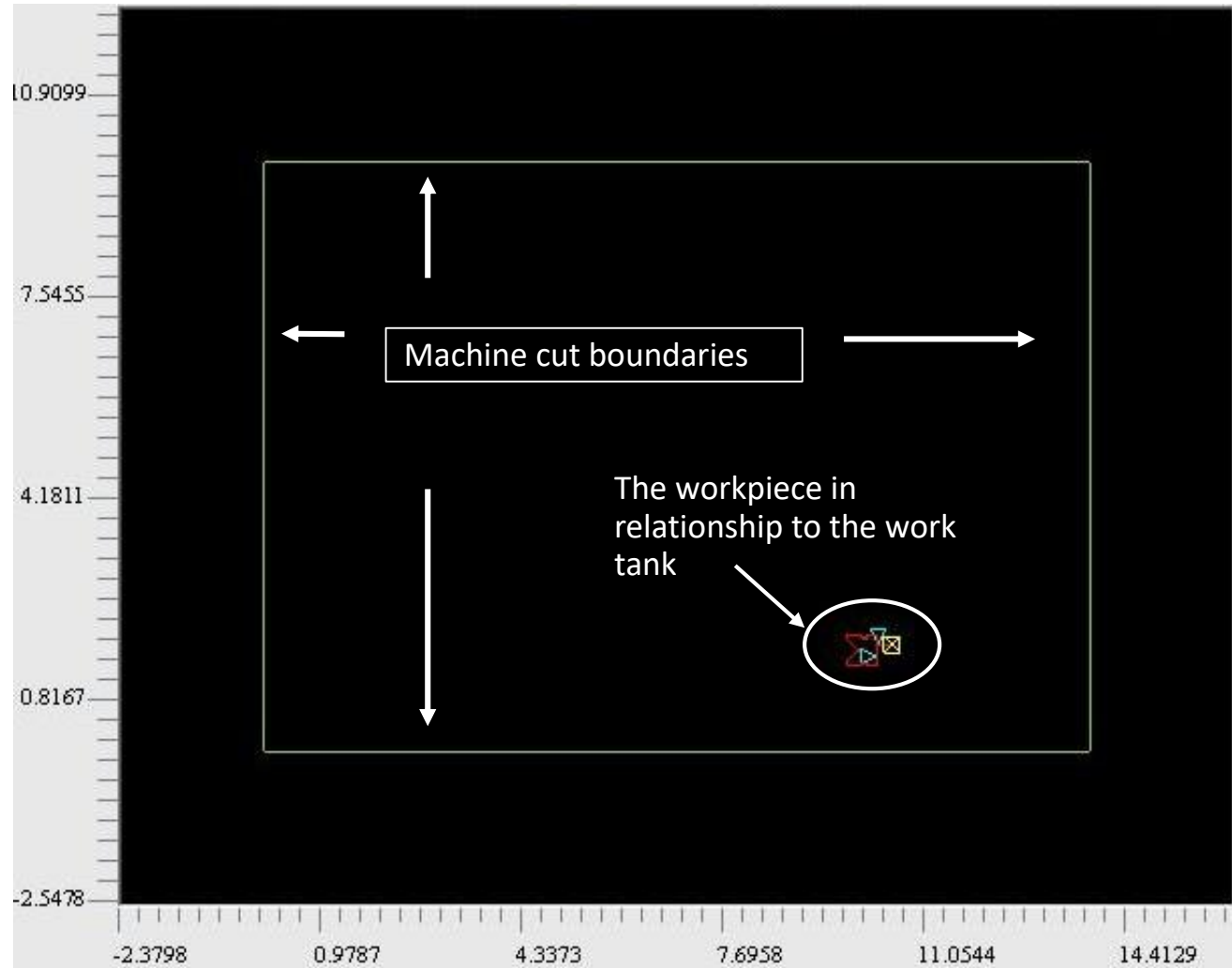
By selecting the 'tank' view, the user can determine if the part program is within the bounds of the work tank and table of the machine





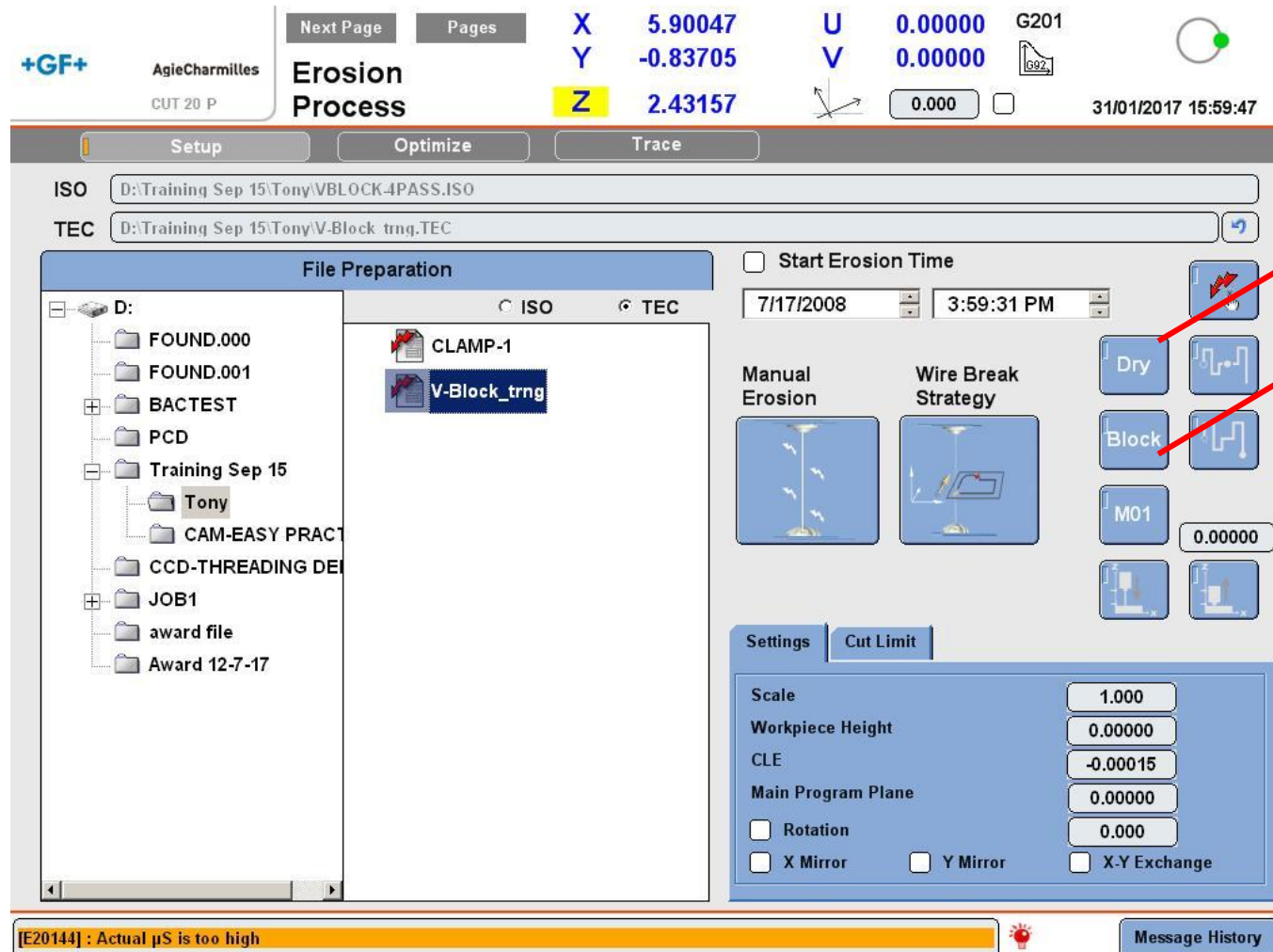
## \* Evaluate part and code

By selecting the 'tank' view, the user can determine if the part program is within the bounds of the work tank and table of the machine



## \* Evaluate part and code

The dry run and single block functions can be utilized to allow the user to run the program and test the movements



DRY RUN: press to start the dry run function

SINGLE BLOCK: will run the program block by block each time the START button is depressed

Technology EntryCut Copy Paste

Generator Parameters

Page1

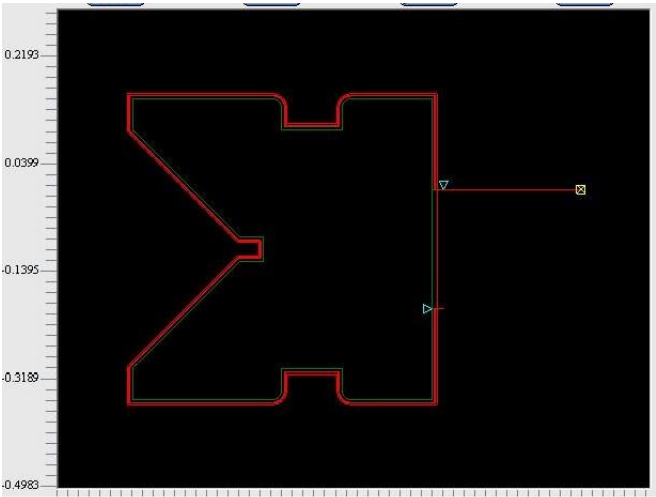
MODULE	0	WTy	Entry
I	17	SPL	5
UHP	0	Ppos	0
ISH	-2	Pneg	1
P	54	Tmis	Default
Ton	32	Teros	Default
SSoll	30	VS	0.01
Reg	0	SMode	0
Str	8		<input checked="" type="checkbox"/> ACO



Use caution when modifying and resaving files

Use preferred file management skills

Always back up a file before modifying and resaving



# *FINIS*

