



GSPC Specification Editor

Graphic Statistical Process Control

by MeltLab Systems

844-MeltLab

www.meltlab.com

Fast • Accurate • Comprehensive

Creating variables and data bases

- The Specification Editor creates definitions for different variables to store such as
 - Numerical Value
 - Date
 - Time
 - Part number (from list)
 - Heat number
 - Comment
 - Name/Value from a list
 - Calculated value (equation)
 - Captured value from an instrument

Specialized input

- Value from a list
 - Spelling is consistent so variable can be searched for
 - Includes 100 item lists for supplier, customer, technician, metal grade, or any other name list needed.
 - Includes special part number list with accompanying special requirements, and information (BHN target/range)

Equations

- Equation Editor includes capabilities of AbsValue, TruncValue, AvgFunc, SumFunc, SqrFunc, SqrtFunc, SinFunc, CosFunc, AtanFunc, ExpFunc, LnFunc, LogFunc, PiValue, ExpValue, Round, MaxFunc, MinFunc, StdError, PopulError, CountFunc, MeanFunc, PowerOp, AimFunc, SigmaFunc, LowRange, UpRange, DateValF, TimeValF, DateTime, RoundFunc, OddFunc, ModOp
- Also includes logic operators and If clauses.

Example equations

- Example Equations: # indicates a test value

No.	Eq Name	Equation/Desc
1	Alloy Facto	$\#1 + 0.25 * \#2 - \#4 / 7$
2	Delta Compact	$\text{If}(\#9 > 0, \#9 - \#3, 0)$
3	Carbon Riser	$(\text{Aim}(\#5) - \#5) * 12000 / (100 * .9)$
4	75% FeSi Add	$(\text{Aim}(\#6) - \#6) * 12000 / (100 * 0.75)$
5	Avg Brinell	$\text{AVG}(\#15, \#17, \#19, \#21, \#23, \#26)$
6	Avg MUL	$\text{Avg}(\#32.. \#34)$
7	Avg Push	$\text{Avg}(\#37.. \#39)$
8	Avg Application	$\text{Avg}(\#45, \#49, \#53)$
9	Ultimate1	$(\#10 / .196)$
10	Yield1	$(\#11 / .196)$
11	Elongation1	$(\#12 / 2 * 100)$

Comments and character strings

- Commonly called String values in programming, combinations of alpha numerics are sometimes useful for comments.
- Problems include human error, abbreviations and other issues that can make these pieces of information unsearchable.
- Where possible use lists of values instead.
- Exceptions would be heat numbers where unique identifiers must be entered. Just be careful.

Captured Instrument data

- Captured data has the benefit of being untouched (unfudged) by human hands.
- Possible Data Capture includes
 - Spectrometer Data
 - Hartley Data
 - Temperature Data
 - Some Brinell Instruments
 - PLC data from molding and or pouring lines

Specialized Calculations - Sand

- GSPC includes the full set of equations developed by Professor Dick Heine and Dick Green. By identifying the 4 basic tests of Moisture, Compactability, Green Strength and MB Clay, these equations are automated.

Sand Variable is

<input type="radio"/> None	<input type="radio"/> Moist/GS/Clay	<input type="radio"/> Clay Eff
<input type="radio"/> Moisture *	<input type="radio"/> Eff Clay	<input type="radio"/> Working Bond
<input type="radio"/> Compactability *	<input type="radio"/> Moist Index	<input type="radio"/> Avail Bond
<input type="radio"/> Green Strength *	<input type="radio"/> Compact Index	<input type="radio"/> Bond Eff
<input checked="" type="radio"/> Methylene Blue Clay *	<input type="radio"/> Sys Eff	<input type="radio"/> Water Balance
<input type="radio"/> Sand Temp	<input type="radio"/> GS Eff	<input type="radio"/> Free Clay
<input type="radio"/> Eq Moister	<input type="radio"/> Mulling Eff	<input type="radio"/> Moist/Compact
<input type="radio"/> Eq Clay-Water	<input type="radio"/> Eff MB Clay	<input type="radio"/> MB Clay/Water
<input type="radio"/> Eq Compact	<input type="radio"/> Eq Clay Parm	<input type="radio"/> Compact/Moist
<input type="radio"/> Clay Water	<input type="radio"/> Test Clay Parm	
<input type="radio"/> Eq Green Str	<input type="radio"/> Avail MBlue	

Specialized Calculations

- Sieve Analysis

- All sieve calculations are automated.

Sieve Variable is

- None
 Total Weight
 FIS Screens
 Sieve Screen Value
 % Fines
 Pan
 AFS GFN

Screen 6	2	No	Sieve Var	Real Number	Sieve Screen
Screen 12	2	No	Sieve Var	Real Number	Sieve Screen
Screen 20	2	No	Sieve Var	Real Number	Sieve Screen
Screen 30	2	No	Sieve Var	Real Number	Sieve Screen
Screen 40	2	No	Sieve Var	Real Number	Sieve Screen
Screen 50	2	No	Sieve Var	Real Number	Sieve Screen
Screen 70	2	No	Sieve Var	Real Number	Sieve Screen
Screen 100	2	No	Sieve Var	Real Number	Sieve Screen
Screen 140	2	No	Sieve Var	Real Number	Sieve Screen
Screen 200	2	No	Sieve Var	Real Number	Sieve Screen
Screen 270	2	No	Sieve Var	Real Number	Sieve Screen
Pan	2	No	Sieve Var	Real Number	Pan
Fines	2	No	Sieve Var	Real Number	% Fines
AFS GFN	2	No	Sieve Var	Real Number	AFS GFN
Total Wt	2	No	Sieve Var	Real Number	Total Weight
FIS Screens	1	No	Sieve Var	Real Number	FIS Screens

Specialized Calculations

- Brinell and Physical Testing

The system understands both BHN and 10 mm ball Brinell diameters and knows how to convert them.

Test#1		No	Inspect Val	List 1	
Brinell		No	Brinell Var	Real Number	Brinell
Tensile(#)		No	Brinell Var	Real Number	Tensile
Yield(#)		No	Brinell Var	Real Number	Yield
Elongation(")	3	No	Brinell Var	Real Number	Elongation

Physical Testing Variables

<input type="radio"/> None	<input type="radio"/> Sigma	<input type="radio"/> Comment
<input type="radio"/> Part	<input type="radio"/> Cp	<input type="radio"/> Operator
<input type="radio"/> # Samples	<input type="radio"/> CpK	<input type="radio"/> Tensile
<input type="radio"/> Min Value	<input type="radio"/> Status	<input type="radio"/> Elongation
<input type="radio"/> Avg Value	<input checked="" type="radio"/> Brinell	<input type="radio"/> Yield
<input type="radio"/> Max Value	<input type="radio"/> Molds	

Test Descriptions

Test Name	Decimal Points	Repeat
9 Brinell	<input checked="" type="radio"/> 0 <input type="radio"/> 2 <input type="radio"/> 4 <input type="radio"/> 6	<input checked="" type="radio"/> No <input type="radio"/> Yes
Abrev	<input type="radio"/> 1 <input type="radio"/> 3 <input type="radio"/> 5	

- Test Name – appears next to test value in all programs
- Abbreviation – can be substituted for Test name when space is limited. Also used to match data names in automatic inputs such as Spectrometer capture.
- Decimal Point – Data is stored to what ever degree of accuracy it is received in. But displayed to this level of accuracy. For example, the Spectrometer may report Silicon to 4 decimal points, but you may choose to display it to a more useable 2 decimal points.
- Repeat – This carries over the last value for this test from the previous sample until changed. This is useful for an operators name, or a lot number.

Test Types

Type Input			
<input type="radio"/> Auto	<input type="radio"/> DisAuto	<input type="radio"/> Leco	<input type="radio"/> Impact
<input type="radio"/> Manual	<input type="radio"/> Ir Corr	<input type="radio"/> InCal	<input type="radio"/> Bend
<input type="radio"/> Calculate	<input type="radio"/> 3rd Manual	<input type="radio"/> Third	<input type="radio"/> Ext Chem
<input type="radio"/> 2nd Manual	<input type="radio"/> MeltLab	<input type="radio"/> Undefined	<input type="radio"/> Sand Var
<input type="radio"/> Increment	<input type="radio"/> Part Desc	<input type="radio"/> PrtDes1	<input type="radio"/> Sieve Var
<input type="radio"/> Incr 2	<input type="radio"/> Mold Desc	<input type="radio"/> PrtDes2	<input checked="" type="radio"/> Brinell Var
<input type="radio"/> In and Calc	<input type="radio"/> Core Desc	<input type="radio"/> PrtDes3	<input type="radio"/> Inspect Val
<input type="radio"/> Reference	<input type="radio"/> Refer	<input type="radio"/> Tensile	
<input type="radio"/> Serial	<input type="radio"/> Serial	<input type="radio"/> Hardness	

There are many different types of data that can be defined. A few are:

Auto – the specific program knows how to handle these.

Manual – operator input

Calculated – an equation is attached.

Increment – this is usually a counter

MeltLab – from MeltLab instrument

Leco – from LECO instrument.

Variable Ranges

Variable	Dec	Min Input	Min Engr	Min Proces	Aim	Max Proces	Max Engr
Carbon	2		2.35	2.50	2.60	2.70	2.85
Silicon	2		1.15	1.25	1.35	1.45	1.55
Phosphorus	3					0.050	0.060
Sulphur	3					0.100	0.100
Manganese	3		0.150	0.200	0.300	0.400	0.450

- Each variable may have a set of ranges associated with it.
- Process ranges control flags to foundry personnel.
- Engineering limits are used for customer Cp, and CpK calculations.
- Aims control graphic targets, and process limits and sigma's are used in control graphics.

Data Storage

File Name Enter in max of 25 characters

Full Path Name C:\GSPC\DATA\physicals

Max Records Enter a number from 100 to 65,000

Current Records

Current Date Ptr

Next Record

Setup a data base by giving it a name and a number of records to keep.

Name Specifications

- You can rename the different specifications to track a multitude of processes.
- Keep similar processes in the same data base, but keep others separated such as sand and metal should have different data bases.
- For example you might want to search all bases for a given tramp element. For that, they need to be in the same data base.

1. Base 65-45-12	31. TA Std Mall	32. 61.
2. Base P-80-55-0	32. TA Lo C Mall	33. 62.
3. Base 60-40-15	33. TA Hi C Mal	34. 63.
4. Base 65-45-08	34.	35. 64.
5. Base M-80-55-0	35.	36. 65.
6. Base 32510L	36. Melting Temp	37. 66.
7. Base 32510	37. Disa 1 Temps	38. 67.
8. Base 32510H	38. Disa 2 Temps	39. 68.
9. All Mall Bases	39.	40. 69.
10. All Bases	40. SteelScrapVer	41. 70.
11. 32510L	41.	42. 71.
12. 32510	42. BailStrapVerif	43. 72.
13. 32510H	43.	44. 73.
14. All Mall Finals	44.	45. 74.
15. 65-45-12	45. CableHead(AD	46. 75.
16. M-80-55-06	46.	47. 76.
17. 60-40-15	47. MechPropertie	48. 77.
18. 65-45-08	48. MineTest(Ass	49. 78.
19. P-80-55-06	49. MineTest(Part	50. 79.
20. All Finals	50.	51. 80.
21. All Ferritic Fi	51. Pop-OutTest	52. 81.
22. All Pearlitic	52.	53. 82.
23.	53.	54. 83.
24. Green Sand	54.	55. 84.
25. Hartley	55. JobbingTest	56. 85.
26. VisiPour	56.	57. 86.
27. Pax-it	57.	58. 87.
28. TA 60-40-15	58.	59. 88.
29. TA 65-45-12	59.	60. 89.
30. TA 65-45-08	60.	90.

Name Lists

- You do not need to use the entire list for one variable.
- Here several lists can be seen. The Melter variable would be given a range from 10 to 12, but be displayed as a choice of 1 to 3.

1. AFS Washed Sand	26. #1	51. No	76.
2. New Sand	27. #2	52. Yes	77.
3. Dry Sand	28. #3	53.	78.
4. SeaCoal D-4	29. #4	54.	79.
5. Bentonite	30. #5	55.	80.
6.	31.	56.	81.
7.	32.	57.	82.
8.	33.	58.	83.
9.	34.	59.	84.
10. Furn 1	35.	60. Pass	85.
11. Furn 2	36.	61. Fail	86.
12. Furn 3	37.	62. Good	87.
13. Disa 1	38.	63. Bad	88.
14. Disa 2	39.	64. VisionPour	89.
15.	40.	65.	90. Kiln#2
16.	41.	66.	91. Kiln#3
17. Baird	42.	67.	92. Kiln#5
18. Atlantis	43.	68.	93. Kiln#8
19.	44.	69.	94. Kiln#9
20. SuppSandSam	45.	70.	95. Kiln#10
21. SuppSandCert	46.	71.	96. Lindberg
22.	47.	72.	97.
23.	48.	73.	98.
24.	49.	74.	99.
25.	50.	75.	100.

Part Numbers

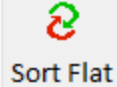



- Part numbers can be displayed as common names or as computer numbers.

Part Numbers	Corp Numbers
Find	Find
000000	#6 Hex Head
1111	#6 SPLICE TUBE
600002	#6 Square Head
600002	#8 THREADBAR COUPL
600004	2 1/4 Washer
600004	50T-3 HOLE BLOCK
600005	97FJ-5655-1-80
600005	ANI 1 1/4 Wedge
600005	B1H Shell
600005	B1HL Wedge
600008	B1HL Wedge 5/8 RH
600008	BEARING BLOCK
600011	BOLSTER SAMPLE
600011	Buddy Nut 3/4 LH
600011	Buddy Nut 7/8 LH
600011	D1 Shell
600014	D10 Shell

Entering new Part Numbers

- Part numbers can be edited by clicking on the item in either of the two previous columns.
- Use the New button to add a part to the system.
- Add all the parts for the day then sort the file to put both lookup tables into alphabetical order.

The screenshot shows a software interface with the following sections:

- Part System Information:**
 - Max Part Numbers: 10001
 - Part Numbers Used: 0 / 319
 - Part Number: [Empty text box]
 - Corp Name: [Empty text box]
 - Current Rec Number: 320 / 320
- Type Part System:**
 - Flat File System
 - Hierarchy System
 - 
- Edit Current Part Number:**
 - Old: [Empty text box] Part Number
 - New: [Empty text box] Part Number
 - Old: [Empty text box] Corp Number
 - New: [Empty text box] Corp Number
- Buttons:**
 - New
 - 
 - 
 - 

Adding a range requirement to a Part

- A Requirement attached to a part number overrides the normal specification limits when that part number is referenced.

Spec M	Spec M	Test	Repeat	Name	Min	Max	REQ
							<input type="radio"/> None
							<input type="radio"/> Part Name
							<input type="radio"/> Iron Grade
							<input type="radio"/> Molding Date
							<input type="radio"/> Hard Iron Ticke
							<input type="radio"/> Annealing Date
							<input type="radio"/> AnnealingProces
							<input type="radio"/> Machining Date
							<input type="radio"/> HeatTreatSuppli
							<input type="radio"/> Supplier Ticket
							<input type="radio"/> Date Tested
							<input type="radio"/> Technician
49	49	14	6	Brinell	170	250	<input type="radio"/> #1 Dome ID
49	49	22	1	MNSL(Test#1	25100	0	<input type="radio"/> TorqBreOut(F/P)
49	49	24	1	MUL	40100	0	<input type="radio"/> #2 Dome ID
49	49	26	1	MNSL(Test#2	25100	0	<input type="radio"/> TorqBreOut(F/P)
49	49	28	1	MUL	40100	0	<input type="radio"/> #3 Dome ID
							<input type="radio"/> TorqBreOut(F/P)
							<input type="radio"/> #4 Dome ID
							<input type="radio"/> TorqBreOut(F/P)
							<input type="radio"/> #5 Dome ID
							<input type="radio"/> TorqBreOut(F/P)
							<input checked="" type="radio"/> Brinell
							<input type="radio"/> Brinell
							<input type="radio"/> Brinell
							<input type="radio"/> Brinell
							<input type="radio"/> Brinell
							<input type="radio"/> Brinell
							<input type="radio"/> Brinell
							<input type="radio"/> AvgBrinell
							<input type="radio"/> MNSL(Test#1)
							<input type="radio"/> Thread Seizure
							<input type="radio"/> MUL(Test#1)
							<input type="radio"/> Thread Strip
							<input type="radio"/> MNSL(Test#2)
							<input type="radio"/> Thread Seizure
							<input type="radio"/> MUL(Test#2)
							<input type="radio"/> Thread Strip
							<input type="radio"/> Comment(s)
							<input type="radio"/> PartCombineWith
							<input type="radio"/> Comment(s)
							<input type="radio"/> Comment(s)
							<input type="radio"/> PartCombineWith
							<input type="radio"/> Comment(s)
							<input type="radio"/> Approved

Data Screen setup

Critical Data Display

Date	Time	Rec	Batch	Temper	Conduct	Compac	Act. Cor	Needed	Added V	Bias	Weight
8/16/12	20:52	60467	104	120	.35	52	54	24.5	24.7	16.2	4491

Amps	Moisture	Strength	Avail Bo	Bond W	Avrg BC	Bond Av	Deviation		Muller Et		Rec
189	5.28	22.5	7.00	70	9.31	8.88	-2				60467

- The order of display can be set here and maintenance on the data base can be preformed.
- When the historical data base is sorted or rebuild, then the other two data bases need rebuilding as well. Click on the Reform button for one specification or click on Reform All to reform all specifications. This can take a little bit of time if you do all.

Critical Data Screen (Last 20 tests)

Critical Data Display

Rec 25	Time	Record	Batch	Temperati	Conductive	Compact A	Act. Comp	Needed V
8/16/12	21:50:08	60486	123	122	.35	52	53	23.5
8/16/12	21:44:25	60485	122	124	.35	52	52	23.8
8/16/12	21:41:26	60484	121	125	.35	52	52	24.0
8/16/12	21:37:26	60483	120	123	.35	52	53	24.3
8/16/12	21:34:11	60482	119	123	.35	52	55	24.6
8/16/12	21:31:51	60481	118	123	.35	52	51	24.6
8/16/12	21:29:09	60480	117	123	.35	52	50	24.0
8/16/12	21:26:35	60479	116	123	.35	52	51	23.6
8/16/12	21:23:58	60478	115	122	.35	52	53	23.7
8/16/12	21:21:26	60477	114	122	.35	52	52	23.8

Process Control Data Screens

Show Critical Data

Zero

Rebuild

Rebuild All

Default Setup