

Effective Purchasing: A Secret to Success in FRC

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Topics

- Benefits
- 971 Purchasing History
- Purchasing Steps
- Accounting
- Model Based Purchasing



Why do I need a purchasing system?

- For ease of ordering parts
- Tracking of orders and accountability in receiving
- Tracking of reimbursements
- It answers the question of where did I order those widgets and when
- Transparency
- Sustainability



A Brief History of 971 Purchasing

- 2009 and before - prehistoric times
- 2010-2011 - rudimentary tracking
- 2012 - the dawn of the purchasing form
- 2013 - the beginning of the modern era - 971 order numbers
- 2014- automation begins
- 2015 - Our first official budget
- 2016 - Accounting!!!
- 2017 - The beginning of model based purchasing



Basic 971 Purchasing Steps

- Ordering - Placing items on the [purchase list](#)
- Purchasing and Order Tracking
- [Package Tracking](#)
- Receiving
- Ordering walk through
- For more information on 971 purchasing and links to Google drive files -

<http://frc971.org/content/ordering-procedures>



Accounting

- Everything traced in [Accounting Log](#)
- Purchases assigned to category
 - Automatically tracks to budget
- Actual expenses compared to budget can be tracked at any time
- Spending is reviewed at every leadership meeting
- Reimbursement lists track who needs to be reimbursed
- System tracks which reimbursements have been processed



Model Based Purchasing

- SolidWorks can export a BOM in spreadsheet form
- This can include custom properties indicating what needs to be ordered
- Actually doing something with this data is often a challenge though:
 - SolidWorks spreadsheet formatting is a mess
 - Parts often end up with incorrect information
- We've yet to smoothly order a robot without editing the tools on the fly...

	A	B	C	D	E	F	G	H	I	J
1	ITEM NO.	PartNumber	PartName	Vendor Part Number	Vendor	FILE NAME	SparesNumber	SparesPercent	Multiplier	QTY.
2	1	971-19-A-2200	Main Assembly			971-19-A-2200_Main Assembly	1	0	1	1
3	1.1	971-19-A-1700	Drivetrain With Electronics			971-19-A-1700_Drivetrain With Electronics	0	0	1	1
4	1.1.1	971-19-A-1000	Drivetrain			971-19-A-1000_Drivetrain	1	0	1	1
5	1.1.1.1	971-19-A-1200	Drivetrain Siderail			971-19-A-1200_Drivetrain Siderail	0	0	1	1
6	1.1.1.1.1	971-19-P-0001	Frame Siderail			971-19-P-0001_Frame Siderail	0	0	1	1
7	1.1.1.1.2	971-19-A-1100	Wheel Tensioner			971-19-A-1100_Wheel Tensioner	0	0	1	1
8	1.1.1.1.2.1	971-19-P-0003	Tensioner Standoff			971-19-P-0003_Tensioner Standoff	0	0	1	1



SolidWorks BOM

- This is the “raw” file from SolidWorks
 - Need to get it exported without extra spaces inserted in various places, etc, which is tricky and changes with each version of SolidWorks/Excel/etc...
- We keep it in a separate Google Sheet for ease of re-uploading

	A	B	C	D	E	F	G	H	I	J
1	ITEM NO.	PartNumber	PartName	Vendor Part Number	Vendor	FILE NAME	SparesNumber	SparesPercent	Multiplier	QTY.
2	1	971-19-A-2200	Main Assembly			971-19-A-2200_Main Assembly	1	0	1	1
3	1.1	971-19-A-1700	Drivetrain With Electronics			971-19-A-1700_Drivetrain With Electronics	0	0	1	1
4	1.1.1	971-19-A-1000	Drivetrain			971-19-A-1000_Drivetrain	1	0	1	1
5	1.1.1.1	971-19-A-1200	Drivetrain Siderail			971-19-A-1200_Drivetrain Siderail	0	0	1	1
6	1.1.1.1.1	971-19-P-0001	Frame Siderail			971-19-P-0001_Frame Siderail	0	0	1	1



“BOM outputs”

- This is the processed BOM, which indicates how many of each part need to be ordered and which assembly they’re in
- This is what drives the rest of the purchasing process

	A	B	C	D	E	F	G
1	name	971 number	vendor	vendor number	total order q	kit quantities	quantity per
2	Main Assembly	971-19-A-2200			2	1 in 971-19-A-2200, 1 in spares	1
3	Drivetrain With Electronics	971-19-A-1700			2	2 in 971-19-A-1700	1
4	Drivetrain	971-19-A-1000			3	2 in 971-19-A-1000, 1 in spares	1
5	Drivetrain Siderail	971-19-A-1200			3	3 in 971-19-A-1200	1
6	Frame Siderail	971-19-P-0001			3	3 in 971-19-A-1200	1
7	Wheel Tensioner	971-19-A-1100			6	3 in 971-19-A-1200, 3 in 971-19-A-2300	2
8	Tensioner Standoff	971-19-P-0003			12	6 in 971-19-A-1200, 6 in 971-19-A-2300	4
9	Deep Grove Ball Bearing, 13.75mm ID, 1.125 OD, 0.313 Width, Flanged		West Coast Products / VEX PRO	217-4006	63	18 in 971-19-A-1200, 15 in 971-19-A-2300, 6 in 971-19-A-2800,	23
10	Tensioner Top Spacer	971-19-P-0005			12	6 in 971-19-A-1200, 6 in 971-19-A-2300	4
11	Tensioner Side Plate V2	971-19-P-0038			576	288 in 971-19-A-1200, 288 in 971-19-A-2300	192
12	#8-32 Nylon-Insert Locknut, Zinc Plated		McMaster	90631A009	109	18 in 971-19-A-1200, 18 in 971-19-A-2300, 72 in 971-19-A-2200	30
13	Outside Wheels Shafts	971-19-P-0039			12	6 in 971-19-A-1200, 6 in 971-19-A-2300	4



Kitting

- Look, I found 3 bearings for the drivetrain. Next week: Look, I found 3 bearings for the arm. Next week after that: We need 3 more bearings right now!
- Also, when somebody goes to put together part of the robot, it's really nice to have all the parts (COTS and custom) in one place
- We grab a box, label it, and put everything for that assembly in there
 - Plus parts organizers for small bits, etc



Kitting integration

- Parts always live with the kit:
 - Once you've found them, and realized they don't need to be ordered, they go in the kit
 - When somebody finishes some parts on the lathe, they go in the kit
 - When parts come in from a sponsor, they go in the kit
 - When you pull some parts out of the kit, then don't put them together, they go back in the kit
 - When you build one instance of an assembly, the rest of the parts go back in the kit
 - Spares go in the kit
- This goes surprisingly far in unifying the inventory management



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Thank You!

