

# Production Planning Case Study

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Constraint Based Production Scheduling

## Acknowledgments

This publication was developed as part of the ENTIRE EDIH project, which received funding from Enterprise Ireland and the European Commission.

Part of this work is based on research conducted with the financial support of Science Foundation Ireland under Grant number 12/RC/2289-P2 at Insight the SFI Research Centre for Data Analytics at UCC, which is co-funded under the European Regional Development Fund.

Part of this work is based on research conducted within the ASSISTANT European project, under the framework program Horizon 2020, ICT-38-2020, Artificial intelligence for manufacturing, grant agreement number 101000165.

## Key Points

- Case study from industry
- Production planning and detailed scheduling
- Based on project with medical devices company in Cork
  - Real problem
  - Realistic data
- Solved in two stages
  - Production planning based on run-out days and safety stock levels
  - Scheduling using our generic scheduling tool

## Problem

This is a case study from industry, combining production planning and detailed scheduling. It is based on a project that some of my colleagues were working on for a local medical devices company. The overall problem is to decide which products to make in which quantities over the planning horizon, so that we have enough stock to satisfy any customer demand, and make sure that we have some safety margin if the demand suddenly increases. At the same time we do not want to create inventory in products that we will not sell in the near future, as this increases our inventory carrying cost.

The company uses two main concepts for production planning: The run-out days for each product state how long the current stock will last, given a projected customer demand profile. We try to achieve the same run-out days value for all products, this works well for fast and slow moving products.

The safety stock values says how much stock we should have for each product. This gives us more control over the stock levels, this works better if the demand cannot be predicted as accurately as we would like, but it is more difficult to compare the stock levels for different products.

The production planning part of the application decides how much to produce for which product, but this is based on an estimate of the production capacity for the planning period. We use the detailed scheduling part of the application to validate the plan generated, and make sure that we can really produce the required capacities in the given planning period.

## Product List

Name	ShortName	Nr	DailySales	InventoryAtStart	CalcDaysCover	LotSize	CycleTime	LotDuration	Machine	ProductType	SafetyStock	SafetyAlert
P1	P1	1	3.20	877	274.06	163	1.33	217	8	pt1	66	253.44
P2	P2	2	11.40	1,011	88.68	240	1.20	288	8	pt2	774	20.79
P3	P3	3	796.20	26,204	32.91	420	2.10	882	5,7,9,10,13,14,16	pt3	12,108	17.70
P4	P4	4	233.80	7,877	33.69	420	2.00	840	5,7,9,10,13,14,16	pt4	3,358	19.33
P5	P5	5	267.30	7,152	26.76	350	2.30	805	5,7,9,10,13,14,16	pt5	3,906	12.14
P6	P6	6	606.20	18,654	30.77	350	2.30	805	5,7,9,10,13,14,16	pt6	9,293	15.44
P7	P7	7	137.30	4,939	35.97	420	2.00	840	5,7,9,10,13,14,16	pt7	1,979	21.56
P8	P8	8	88.30	3,152	35.70	350	2.30	805	5,7,9,10,13,14,16	pt8	1,342	20.50
P9	P9	9	77.20	2,688	34.82	420	2.10	882	5,7,9,10,13,14,16	pt9	1,082	20.80
P10	P10	10	165.60	5,971	36.06	420	2.10	882	5,7,9,10,13,14,16	pt10	2,649	20.06
P11	P11	11	60.70	2,310	38.06	420	2.10	882	5,7,9,10,13,14,16	pt11	877	23.61
P12	P12	12	51.80	1,928	37.22	350	2.30	805	5,7,9,10,13,14,16	pt12	883	20.17
P13	P13	13	79.00	2,231	28.24	320	2.30	736	5,7,9,10,13,14,16	pt13	1,193	13.14
P14	P14	14	271.20	8,951	33.01	432	2.10	908	5,7,9,10,13,14,16	pt14	3,732	19.24
P15	P15	15	86.60	3,244	37.46	336	2.00	672	5,7,9,10,13,14,16	pt15	1,454	20.67
P16	P16	16	42.40	2,110	49.76	420	2.10	882	5,7,9,10,13,14,16	pt16	875	29.13
P17	P17	17	17.60	681	38.69	420	2.00	840	5,7,9,10,13,14,16	pt17	290	22.22
P18	P18	18	217.50	5,710	26.25	336	2.00	672	5,7,9,10,13,14,16	pt18	2,814	13.31
P19	P19	19	56.30	2,450	43.52	420	2.00	840	5,7,9,10,13,14,16	pt19	804	29.24
P20	P20	20	13.60	506	37.21	480	2.00	960	5,7,9,10,13,14,16	pt20	272	17.21
P21	P21	21	10.80	977	90.46	360	2.10	756	5,7,9,10,13,14,16	pt21	293	63.33
P22	P22	22	21.80	1,538	70.55	420	2.00	840	5,7,9,10,13,14,16	pt22	349	54.54
P23	P23	23	189.10	5,195	27.47	360	2.30	828	5,7,9,10,13,14,16	pt23	2,941	11.92
P24	P24	24	9.50	886	93.26	350	2.30	805	5,7,9,10,13,14,16	pt24	191	73.16
P25	P25	25	7.50	326	43.47	120	2.30	276	5,7,9,10,13,14,16	pt25	210	15.47
P26	P26	26	11.60	418	36.03	360	2.10	756	5,7,9,10,13,14,16	pt26	187	19.91
P27	P27	27	16.50	1,388	84.12	480	2.10	1,008	5,7,9,10,13,14,16	pt27	218	70.91

## Product List (Sorted by Daily Sales)

Product X														
Name	ShortName	Nr	DailySales▼	InventoryAtStart	CalcDaysCover	LotSize	CycleTime	LotDuration	Machine	ProductType	SafetyStock	SafetyAlert		
P3	P3	3	796.20	26,204	32.91	420	2.10	882	5,7,9,10,13,14,16	pt3	12,108	17.70		
P6	P6	6	606.20	18,654	30.77	350	2.30	805	5,7,9,10,13,14,16	pt6	9,293	15.44		
P14	P14	14	271.20	8,951	33.01	432	2.10	908	5,7,9,10,13,14,16	pt14	3,732	19.24		
P53	P53	53	267.70	8,264	30.87	504	1.20	605	1,2,3,8	pt2	3,734	16.92		
P5	P5	5	267.30	7,152	26.76	350	2.30	805	5,7,9,10,13,14,16	pt5	3,906	12.14		
P124	P124	124	242.70	16,503	68.00	240	5.00	1,200	15,18,19	pt65	3,595	53.19		
P4	P4	4	233.80	7,877	33.69	420	2.00	840	5,7,9,10,13,14,16	pt4	3,358	19.33		
P123	P123	123	223.40	7,600	34.02	490	2.33	1,142	1,2,3,8	pt51	3,738	17.29		
P18	P18	18	217.50	5,710	26.25	336	2.00	672	5,7,9,10,13,14,16	pt18	2,814	13.31		
P23	P23	23	189.10	5,195	27.47	360	2.30	828	5,7,9,10,13,14,16	pt23	2,941	11.92		
P56	P56	56	168.20	4,824	28.68	504	1.20	605	1,2,3,8	pt2	2,660	12.87		
P10	P10	10	165.60	5,971	36.06	420	2.10	882	5,7,9,10,13,14,16	pt10	2,649	20.06		
P59	P59	59	152.80	5,666	37.08	420	1.33	559	1,2,3,8	pt51	3,095	16.83		
P7	P7	7	137.30	4,939	35.97	420	2.00	840	5,7,9,10,13,14,16	pt7	1,979	21.56		
P57	P57	57	134.80	5,358	39.75	588	1.10	647	1,2,3,8	pt53	2,294	22.73		
P36	P36	36	133.50	3,895	29.18	336	2.00	672	5,7,9,10,13,14,16	pt36	2,057	13.77		
P54	P54	54	122.40	5,059	41.33	480	1.33	639	1,2,3,8	pt51	1,965	25.28		
P121	P121	121	98.10	4,334	44.18	588	1.10	647	1,2,3,8	pt53	1,524	28.64		
P8	P8	8	88.30	3,152	35.70	350	2.30	805	5,7,9,10,13,14,16	pt8	1,342	20.50		
P125	P125	125	86.90	8,593	98.88	240	5.00	1,200	15,18,19	pt65	1,022	87.12		
P15	P15	15	86.60	3,244	37.46	336	2.00	672	5,7,9,10,13,14,16	pt15	1,454	20.67		
P100	P100	100	85.20	2,665	31.28	420	1.33	559	1,2,3,8	pt56	1,115	18.19		
P55	P55	55	79.50	2,876	36.18	441	2.33	1,028	1,2,3,8	pt52	1,367	18.98		
P13	P13	13	79.00	2,231	28.24	320	2.30	736	5,7,9,10,13,14,16	pt13	1,193	13.14		
P9	P9	9	77.20	2,688	34.82	420	2.10	882	5,7,9,10,13,14,16	pt9	1,082	20.80		
P47	P47	47	74.60	5,391	72.27	160	6.84	1,095	2,11	pt47	1,132	57.09		
P11	P11	11	60.70	2,310	38.06	420	2.10	882	5,7,9,10,13,14,16	pt11	877	23.61		
P61	P61	61	60.30	2,758	45.74	490	1.33	652	1,2,3,8	pt56	1,073	27.94		
P78	P78	78	57.60	2,234	38.78	588	1.10	647	1,2,3,8	pt59	824	24.48		
P19	P19	19	56.30	2,450	43.52	420	2.00	840	5,7,9,10,13,14,16	pt19	804	29.24		

### Product List (Sorted by Days Cover)

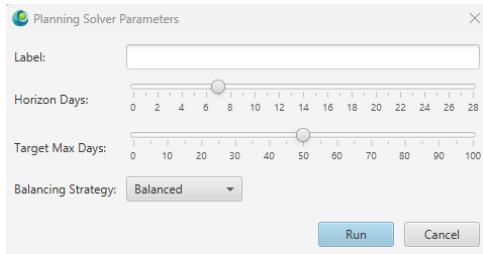
Product X														
Name	ShortName	Nr	DailySales	InventoryAtStart	CalcDaysCover	LotSize	CycleTime	LotDuration	Machine	ProductType	SafetyStock	SafetyAlert		
P35	P35	35	1.30	26	20.00	120	2.30	276	5,7,9,10,13,14,16	pt35	33	0.00		
P18	P18	18	217.50	5,710	26.25	336	2.00	672	5,7,9,10,13,14,16	pt18	2,814	13.31		
P5	P5	5	267.30	7,152	26.76	350	2.30	805	5,7,9,10,13,14,16	pt5	3,906	12.14		
P23	P23	23	189.10	5,195	27.47	360	2.30	828	5,7,9,10,13,14,16	pt23	2,941	11.92		
P13	P13	13	79.00	2,231	28.24	320	2.30	736	5,7,9,10,13,14,16	pt13	1,193	13.14		
P56	P56	56	168.20	4,824	28.68	504	1.20	605	1,2,3,8	pt2	2,660	12.87		
P58	P58	58	55.00	1,590	28.91	420	2.33	979	1,2,3,8	pt54	1,208	6.95		
P36	P36	36	133.50	3,895	29.18	336	2.00	672	5,7,9,10,13,14,16	pt36	2,057	13.77		
P6	P6	6	606.20	18,654	30.77	350	2.30	805	5,7,9,10,13,14,16	pt6	9,293	15.44		
P53	P53	53	267.70	8,264	30.87	504	1.20	605	1,2,3,8	pt2	3,734	16.92		
P100	P100	100	85.20	2,665	31.28	420	1.33	559	1,2,3,8	pt56	1,115	18.19		
P122	P122	122	45.40	1,421	31.30	490	1.33	652	1,2,3,8	pt56	725	15.33		
P3	P3	3	796.20	26,204	32.91	420	2.10	882	5,7,9,10,13,14,16	pt3	12,108	17.70		
P14	P14	14	271.20	8,951	33.01	432	2.10	908	5,7,9,10,13,14,16	pt14	3,732	19.24		
P4	P4	4	233.80	7,877	33.69	420	2.00	840	5,7,9,10,13,14,16	pt4	3,358	19.33		
P123	P123	123	223.40	7,600	34.02	490	2.33	1,142	1,2,3,8	pt51	3,738	17.29		
P77	P77	77	33.00	1,146	34.73	336	1.20	404	1,2,3,8	pt61	565	17.61		
P9	P9	9	77.20	2,688	34.82	420	2.10	882	5,7,9,10,13,14,16	pt9	1,082	20.80		
P8	P8	8	88.30	3,152	35.70	350	2.30	805	5,7,9,10,13,14,16	pt8	1,342	20.50		
P7	P7	7	137.30	4,939	35.97	420	2.00	840	5,7,9,10,13,14,16	pt7	1,979	21.56		
P26	P26	26	11.60	418	36.03	360	2.10	756	5,7,9,10,13,14,16	pt26	187	19.91		
P10	P10	10	165.60	5,971	36.06	420	2.10	882	5,7,9,10,13,14,16	pt10	2,649	20.06		
P55	P55	55	79.50	2,876	36.18	441	2.33	1,028	1,2,3,8	pt52	1,367	18.98		
P63	P63	63	42.40	1,565	36.91	490	1.33	652	1,2,3,8	pt51	689	20.66		
P59	P59	59	152.80	5,666	37.08	420	1.33	559	1,2,3,8	pt51	3,095	16.83		
P20	P20	20	13.60	506	37.21	480	2.00	960	5,7,9,10,13,14,16	pt20	272	17.21		
P12	P12	12	51.80	1,928	37.22	350	2.30	805	5,7,9,10,13,14,16	pt12	883	20.17		
P44	P44	44	5.50	205	37.27	360	2.10	756	5,7,9,10,13,14,16	pt44	126	14.36		
P15	P15	15	86.60	3,244	37.46	336	2.00	672	5,7,9,10,13,14,16	pt15	1,454	20.67		

### Product List (Sorted by Safety Alert)

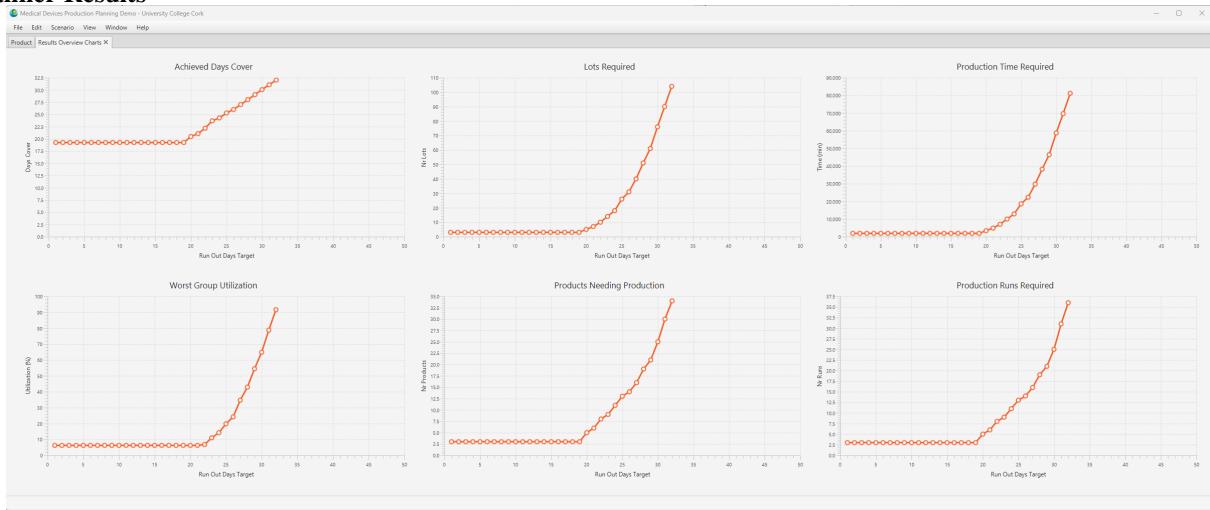
Product X															
Name	ShortName	Nr	DailySales	InventoryAtStart	CalcDaysCover	LotSize	CycleTime	LotDuration	Machine	ProductType	SafetyStock	SafetyAl...▲			
P35	P35	35	1.30	26	20.00	120	2.30	276	5,7,9,10,13,14,16	pt35	33	0.00			
P51	P51	51	5.70	405	71.05	140	4.50	630	2	pt50	381	4.21			
P58	P58	58	55.00	1,590	28.91	420	2.33	979	1,2,3,8	pt54	1,208	6.95			
P82	P82	82	6.10	259	42.46	441	1.33	587	1,2,3,8	pt51	189	11.48			
P23	P23	23	189.10	5,195	27.47	360	2.30	828	5,7,9,10,13,14,16	pt23	2,941	11.92			
P5	P5	5	267.30	7,152	26.76	350	2.30	805	5,7,9,10,13,14,16	pt5	3,906	12.14			
P56	P56	56	168.20	4,824	28.68	504	1.20	605	1,2,3,8	pt2	2,660	12.87			
P13	P13	13	79.00	2,231	28.24	320	2.30	736	5,7,9,10,13,14,16	pt13	1,193	13.14			
P18	P18	18	217.50	5,710	26.25	336	2.00	672	5,7,9,10,13,14,16	pt18	2,814	13.31			
P36	P36	36	133.50	3,895	29.18	336	2.00	672	5,7,9,10,13,14,16	pt36	2,057	13.77			
P44	P44	44	5.50	205	37.27	360	2.10	756	5,7,9,10,13,14,16	pt44	126	14.36			
P122	P122	122	45.40	1,421	31.30	490	1.33	652	1,2,3,8	pt56	725	15.33			
P6	P6	6	606.20	18,654	30.77	350	2.30	805	5,7,9,10,13,14,16	pt6	9,293	15.44			
P25	P25	25	7.50	326	43.47	120	2.30	276	5,7,9,10,13,14,16	pt25	210	15.47			
P59	P59	59	152.80	5,666	37.08	420	1.33	559	1,2,3,8	pt51	3,095	16.83			
P53	P53	53	267.70	8,264	30.87	504	1.20	605	1,2,3,8	pt2	3,734	16.92			
P112	P112	112	3.40	134	39.41	588	1.20	706	1,2,3,8	pt2	76	17.06			
P20	P20	20	13.60	506	37.21	480	2.00	960	5,7,9,10,13,14,16	pt20	272	17.21			
P32	P32	32	5.40	222	41.11	480	2.00	960	5,7,9,10,13,14,16	pt32	129	17.22			
P123	P123	123	223.40	7,600	34.02	490	2.33	1,142	1,2,3,8	pt51	3,738	17.29			
P99	P99	99	5.70	247	43.33	96	2.00	192	1,2,3,8	pt60	148	17.37			
P77	P77	77	33.00	1,146	34.73	336	1.20	404	1,2,3,8	pt61	565	17.61			
P3	P3	3	796.20	26,204	32.91	420	2.10	882	5,7,9,10,13,14,16	pt3	12,108	17.70			
P100	P100	100	85.20	2,665	31.28	420	1.33	559	1,2,3,8	pt56	1,115	18.19			
P55	P55	55	79.50	2,876	36.18	441	2.33	1,028	1,2,3,8	pt52	1,367	18.98			
P14	P14	14	271.20	8,951	33.01	432	2.10	908	5,7,9,10,13,14,16	pt14	3,732	19.24			
P80	P80	80	7.20	293	40.69	420	1.33	559	1,2,3,8	pt51	154	19.31			
P4	P4	4	233.80	7,877	33.69	420	2.00	840	5,7,9,10,13,14,16	pt4	3,358	19.33			
P49	P49	49	50.90	2,273	44.66	378	1.00	378	2	pt48	1,260	19.90			

## Setup Matrix

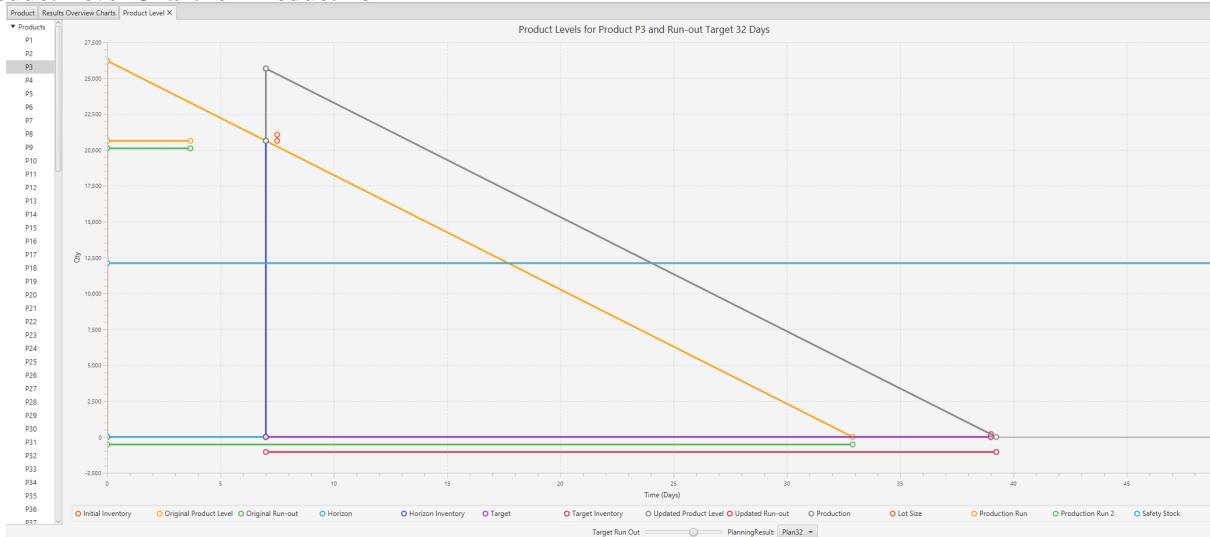
Row		Setup Matrix X	p1t1	p1t2	p1t3	p1t4	p1t5	p1t6	p1t7	p1t8	p1t9	p1t10	p1t11	p1t12	p1t13	p1t14	p1t15	p1t16	p1t17	p1t18	p1t19	p1t20	p1t21	p1t22	p1t23	p1t24	p1t25	p1t26	p1t27	p1t28	p1t29	p1t30	p1t31	p1t32	p1t33	p1t34	p1t35	p1t36	p1t37	p1t38	p1t39	p1t40	p1t41	p1t42	p1t43	p1t44	p1t45	p1t46	p1t47	p1t48	p1t49	p1t50	p1t51	p1t52	p1t53	p1t54	p1t55	p1t56	p1t57	p1t58	p1t59	p1t60	p1t61	p1t62	p1t63	p1t64	p1t65	p1t66	p1t67	p1t68	p1t69	p1t70	p1t71	p1t72	p1t73	p1t74	p1t75	p1t76	p1t77	p1t78	p1t79	p1t80	p1t81	p1t82	p1t83	p1t84	p1t85	p1t86	p1t87	p1t88	p1t89	p1t90	p1t91	p1t92	p1t93	p1t94	p1t95	p1t96	p1t97	p1t98	p1t99	p1t100	p1t101	p1t102	p1t103	p1t104	p1t105	p1t106	p1t107	p1t108	p1t109	p1t110	p1t111	p1t112	p1t113	p1t114	p1t115	p1t116	p1t117	p1t118	p1t119	p1t120	p1t121	p1t122	p1t123	p1t124	p1t125	p1t126	p1t127	p1t128	p1t129	p1t130	p1t131	p1t132	p1t133	p1t134	p1t135	p1t136	p1t137	p1t138	p1t139	p1t140	p1t141	p1t142	p1t143	p1t144	p1t145	p1t146	p1t147	p1t148	p1t149	p1t150	p1t151	p1t152	p1t153	p1t154	p1t155	p1t156	p1t157	p1t158	p1t159	p1t160	p1t161	p1t162	p1t163	p1t164	p1t165	p1t166	p1t167	p1t168	p1t169	p1t170	p1t171	p1t172	p1t173	p1t174	p1t175	p1t176	p1t177	p1t178	p1t179	p1t180	p1t181	p1t182	p1t183	p1t184	p1t185	p1t186	p1t187	p1t188	p1t189	p1t190	p1t191	p1t192	p1t193	p1t194	p1t195	p1t196	p1t197	p1t198	p1t199	p1t200	p1t201	p1t202	p1t203	p1t204	p1t205	p1t206	p1t207	p1t208	p1t209	p1t210	p1t211	p1t212	p1t213	p1t214	p1t215	p1t216	p1t217	p1t218	p1t219	p1t220	p1t221	p1t222	p1t223	p1t224	p1t225	p1t226	p1t227	p1t228	p1t229	p1t230	p1t231	p1t232	p1t233	p1t234	p1t235	p1t236	p1t237	p1t238	p1t239	p1t240	p1t241	p1t242	p1t243	p1t244	p1t245	p1t246	p1t247	p1t248	p1t249	p1t250	p1t251	p1t252	p1t253	p1t254	p1t255	p1t256	p1t257	p1t258	p1t259	p1t260	p1t261	p1t262	p1t263	p1t264	p1t265	p1t266	p1t267	p1t268	p1t269	p1t270	p1t271	p1t272	p1t273	p1t274	p1t275	p1t276	p1t277	p1t278	p1t279	p1t280	p1t281	p1t282	p1t283	p1t284	p1t285	p1t286	p1t287	p1t288	p1t289	p1t290	p1t291	p1t292	p1t293	p1t294	p1t295	p1t296	p1t297	p1t298	p1t299	p1t300	p1t301	p1t302	p1t303	p1t304	p1t305	p1t306	p1t307	p1t308	p1t309	p1t310	p1t311	p1t312	p1t313	p1t314	p1t315	p1t316	p1t317	p1t318	p1t319	p1t320	p1t321	p1t322	p1t323	p1t324	p1t325	p1t326	p1t327	p1t328	p1t329	p1t330	p1t331	p1t332	p1t333	p1t334	p1t335	p1t336	p1t337	p1t338	p1t339	p1t340	p1t341	p1t342	p1t343	p1t344	p1t345	p1t346	p1t347	p1t348	p1t349	p1t350	p1t351	p1t352	p1t353	p1t354	p1t355	p1t356	p1t357	p1t358	p1t359	p1t360	p1t361	p1t362	p1t363	p1t364	p1t365	p1t366	p1t367	p1t368	p1t369	p1t370	p1t371	p1t372	p1t373	p1t374	p1t375	p1t376	p1t377	p1t378	p1t379	p1t380	p1t381	p1t382	p1t383	p1t384	p1t385	p1t386	p1t387	p1t388	p1t389	p1t390	p1t391	p1t392	p1t393	p1t394	p1t395	p1t396	p1t397	p1t398	p1t399	p1t400	p1t401	p1t402	p1t403	p1t404	p1t405	p1t406	p1t407	p1t408	p1t409	p1t410	p1t411	p1t412	p1t413	p1t414	p1t415	p1t416	p1t417	p1t418	p1t419	p1t420	p1t421	p1t422	p1t423	p1t424	p1t425	p1t426	p1t427	p1t428	p1t429	p1t430	p1t431	p1t432	p1t433	p1t434	p1t435	p1t436	p1t437	p1t438	p1t439	p1t440	p1t441	p1t442	p1t443	p1t444	p1t445	p1t446	p1t447	p1t448	p1t449	p1t450	p1t451	p1t452	p1t453	p1t454	p1t455	p1t456	p1t457	p1t458	p1t459	p1t460	p1t461	p1t462	p1t463	p1t464	p1t465	p1t466	p1t467	p1t468	p1t469	p1t470	p1t471	p1t472	p1t473	p1t474	p1t475	p1t476	p1t477	p1t478	p1t479	p1t480	p1t481	p1t482	p1t483	p1t484	p1t485	p1t486	p1t487	p1t488	p1t489	p1t490	p1t491	p1t492	p1t493	p1t494	p1t495	p1t496	p1t497	p1t498	p1t499	p1t500	p1t501	p1t502	p1t503	p1t504	p1t505	p1t506	p1t507	p1t508	p1t509	p1t510	p1t511	p1t512	p1t513	p1t514	p1t515	p1t516	p1t517	p1t518	p1t519	p1t520	p1t521	p1t522	p1t523	p1t524	p1t525	p1t526	p1t527	p1t528	p1t529	p1t530	p1t531	p1t532	p1t533	p1t534	p1t535	p1t536	p1t537	p1t538	p1t539	p1t540	p1t541	p1t542	p1t543	p1t544	p1t545	p1t546	p1t547	p1t548	p1t549	p1t550	p1t551	p1t552	p1t553	p1t554	p1t555	p1t556	p1t557	p1t558	p1t559	p1t560	p1t561	p1t562	p1t563	p1t564	p1t565	p1t566	p1t567	p1t568	p1t569	p1t570	p1t571	p1t572	p1t573	p1t574	p1t575	p1t576	p1t577	p1t578	p1t579	p1t580	p1t581	p1t582	p1t583	p1t584	p1t585	p1t586	p1t587	p1t588	p1t589	p1t590	p1t591	p1t592	p1t593	p1t594	p1t595	p1t596	p1t597	p1t598	p1t599	p1t600	p1t601	p1t602	p1t603	p1t604	p1t605	p1t606	p1t607	p1t608	p1t609	p1t610	p1t611	p1t612	p1t613	p1t614	p1t615	p1t616	p1t617	p1t618	p1t619	p1t620	p1t621	p1t622	p1t623	p1t624	p1t625	p1t626	p1t627	p1t628	p1t629	p1t630	p1t631	p1t632	p1t633	p1t634	p1t635	p1t636	p1t637	p1t638	p1t639	p1t640	p1t641	p1t642	p1t643	p1t644	p1t645	p1t646	p1t647	p1t648	p1t649	p1t650	p1t651	p1t652	p1t653	p1t654	p1t655	p1t656	p1t657	p1t658	p1t659	p1t660	p1t661	p1t662	p1t663	p1t664	p1t665	p1t666	p1t667	p1t668</



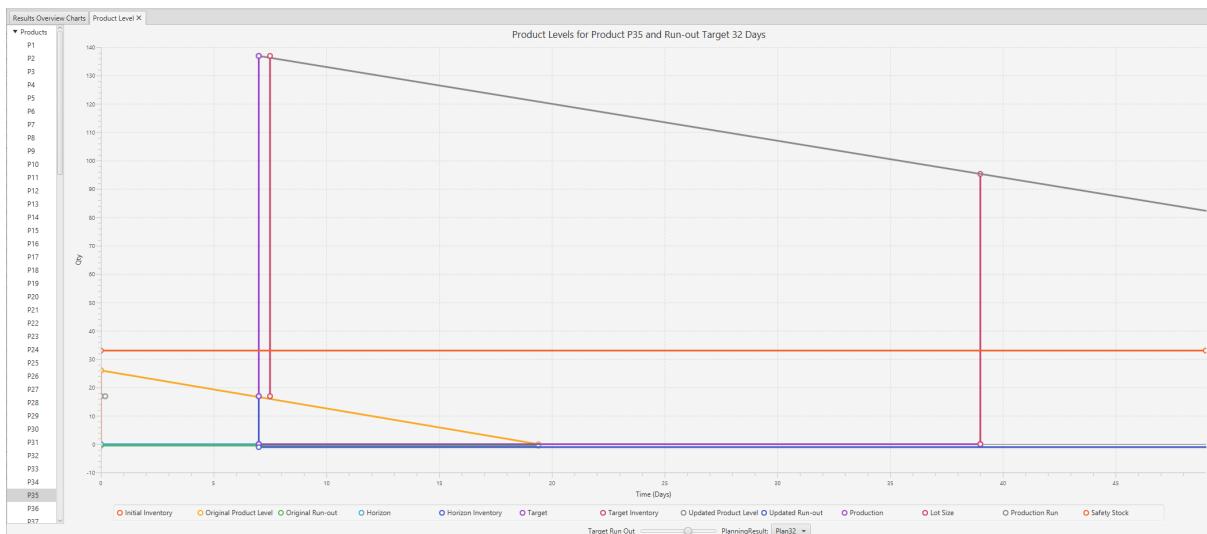
## Planner Results



## Product Level Chart for Product P3



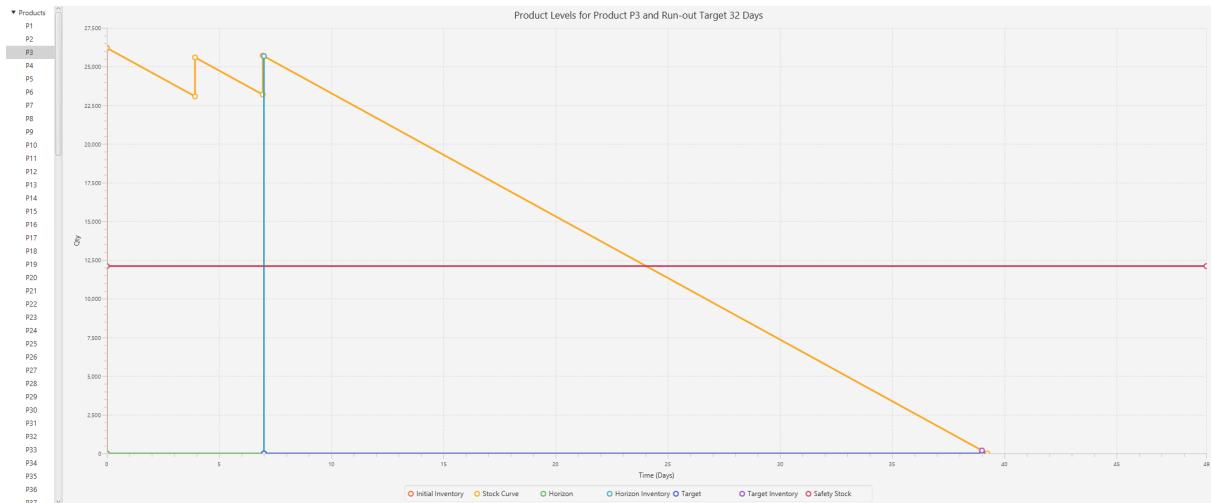
## Product Level Chart for Product P35



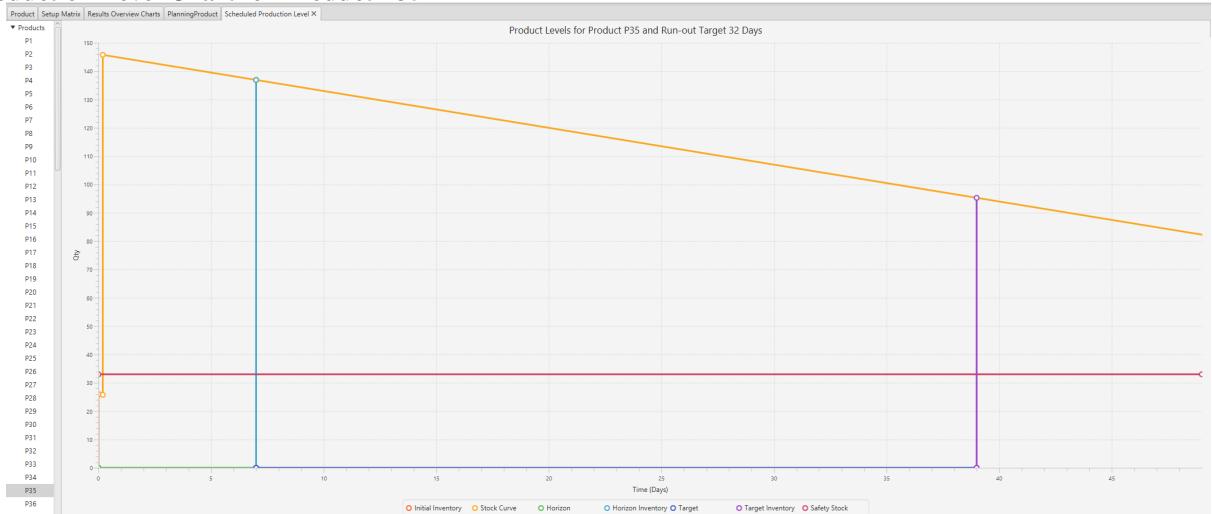
## Scheduled Production Runs

Product	Results Overview Charts		Product Level		Scheduled Production Level		ProductionRun X		
Name	Product	NrLots	Qty	Due	Start	End	Duration	StartDay	EndDay
job3_0	P3	6	2,520	10,080	366	5,658	5,292	0.25	3.93
job3_1	P3	6	2,520	10,080	4,712	10,004	5,292	3.27	6.95
job4_0	P4	3	1,260	10,080	0	2,520	2,520	0.00	1.75
job5_0	P5	10	3,500	10,080	1,794	9,844	8,050	1.25	6.84
job6_0	P6	7	2,450	10,080	4,224	9,859	5,635	2.93	6.85
job6_1	P6	8	2,800	10,080	0	6,440	6,440	0.00	4.47
job7_0	P7	1	420	10,080	7,442	8,282	840	5.17	5.75
job8_0	P8	1	350	10,080	816	1,621	805	0.57	1.13
job9_0	P9	1	420	10,080	3,282	4,164	882	2.28	2.89
job10_0	P10	2	840	10,080	0	1,764	1,764	0.00	1.23
job11_0	P11	1	420	10,080	6,500	7,382	882	4.51	5.13
job12_0	P12	1	350	10,080	1,651	2,456	805	1.15	1.71
job13_0	P13	3	960	10,080	0	2,208	2,208	0.00	1.53
job14_0	P14	4	1,728	10,080	0	3,632	3,632	0.00	2.52
job15_0	P15	1	336	10,080	2,580	3,252	672	1.79	2.26
job17_0	P17	1	420	10,080	5,718	6,558	840	3.97	4.55
job18_0	P18	9	3,024	10,080	3,144	9,192	6,048	2.18	6.38
job20_0	P20	1	480	10,080	3,692	4,652	960	2.56	3.23
job23_0	P23	7	2,520	10,080	2,516	8,312	5,796	1.75	5.77
job26_0	P26	1	360	10,080	0	756	756	0.00	0.53
job35_0	P35	1	120	0	0	276	276	0.00	0.19
job36_0	P36	4	1,344	10,080	6,618	9,306	2,688	4.60	6.46
job44_0	P44	1	360	10,080	2,298	3,054	756	1.60	2.12
job46_0	P46	1	350	10,080	8,372	9,177	805	5.81	6.37
job51_0	P51	1	140	6,064	0	630	630	0.00	0.44
job53_0	P53	5	2,520	10,080	707	3,732	3,025	0.49	2.59
job55_0	P55	1	441	10,080	2,580	3,608	1,028	1.79	2.51
job56_0	P56	4	2,016	10,080	7,218	9,638	2,420	5.01	6.69
job58_0	P58	2	840	10,002	3,668	5,626	1,958	2.55	3.91
job59_0	P59	1	420	10,080	464	1,023	559	0.32	0.71
job63_0	P63	1	490	10,080	0	652	652	0.00	0.45
job77_0	P77	1	336	10,080	0	404	404	0.00	0.28
job78_0	P78	1	588	10,080	0	647	647	0.00	0.45

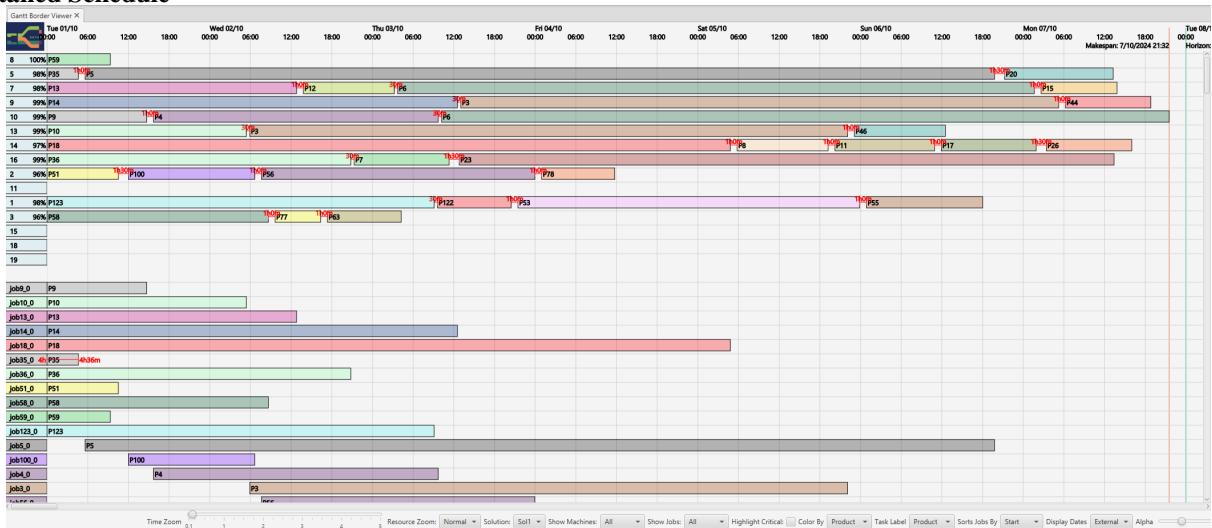
## Production Level Chart for Product P3



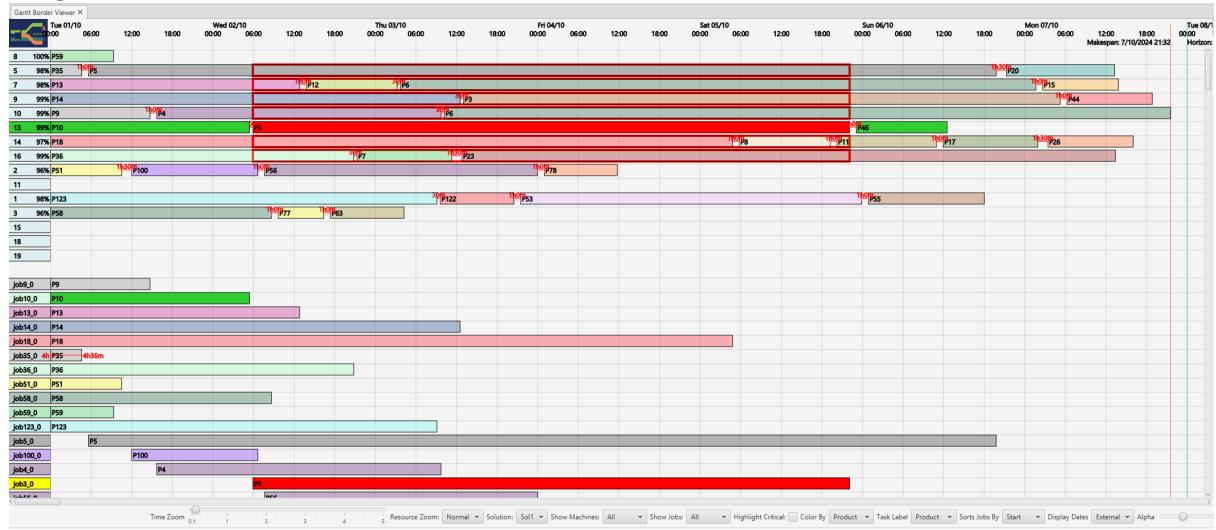
## Production Level Chart for Product P35



## **Detailed Schedule**



## Showing Alternative Machines in Gantt Chart



## Summary

- We demonstrated the use of our scheduling tool inside a production planning problem from industry
  - Production planning decides which products to make in which quantity
    - Balance stock levels against projected demand
    - Allow for product specific safety stock levels
  - Uses estimate of production capacity over planning horizon
  - Use detailed scheduling to validate plan