
Synoptik Product Suite –

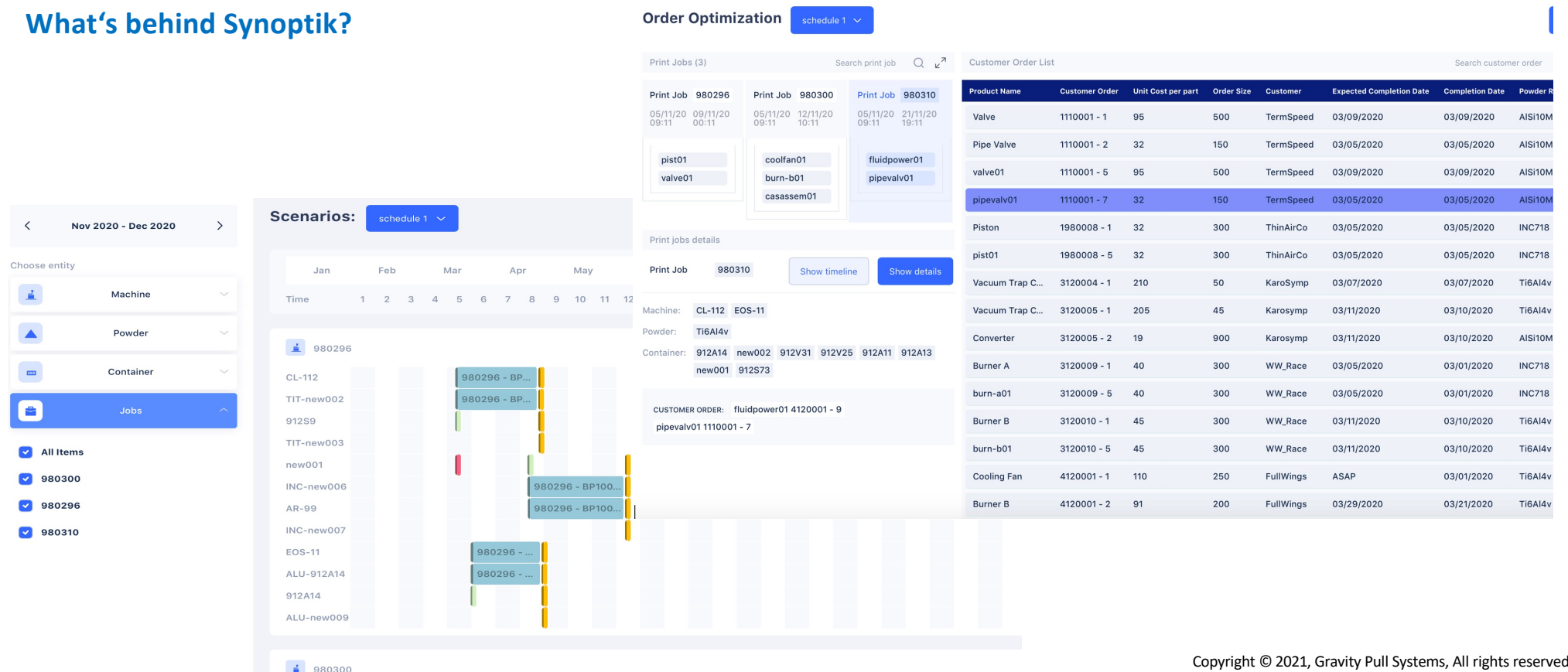
Enabling Digitization in Additive Manufacturing

Synoptik Product Suite.

Enabler of Industrialization in AM.



What's behind Synoptik?



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Synoptik Product Suite. Enabler of Industrialization in AM.



What's behind Synoptik?

Implementing digitalization in real production environments to achieve Industry 4.0 / IoT standard in AM:

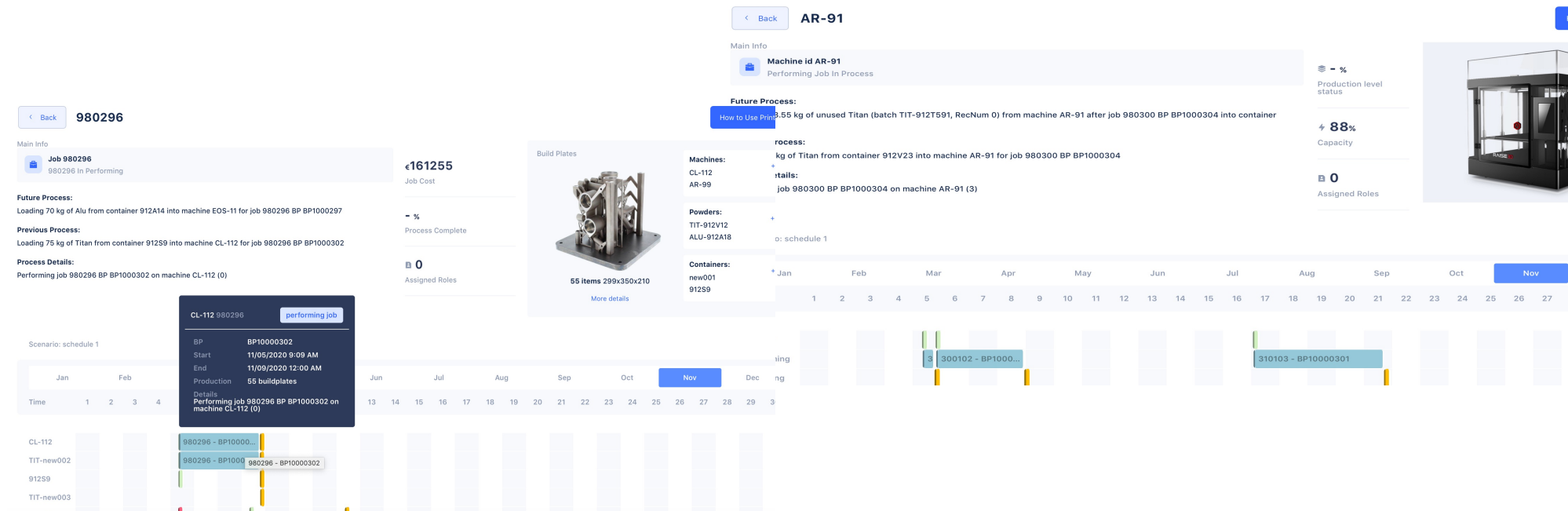
- **Scheduling Optimizer „Synoptik G-OPT“**
 - Calculates the most optimal schedule for costs
 - Pre-configured for AM-specific best practice scenarios
 - Continuous re-scheduling of any changes on the shopfloor in real time
 - Clear routing instructions, process parameter proposals, material recycling strategy, calculated planned costs
- **Manufacturing Execution System (MES) „Synoptik G-MON“**
 - Tracks&Traces the entire process lifecycle from digital files to QI and delivery, logging :
 - manufacturing events
 - process parameters
 - material consumption, recycling, properties
 - material and end-part quality inspection results
- **Re-active and agile scheduling**
 - Integrated solution: G-OPT + G-MON

Synoptik Product Suite.

Holistically optimized overall processes in AM.



Synoptik achieves...?



Synoptik Product Suite.

Holistically optimized overall processes in AM.



Synoptik achieves...?

- **Entire production process on one platform** - from quoting & order entry management to detailed scheduling to production tracking including post-processing
- **Dynamic adaptation of scheduling** based on manufacturing events and changed process parameters, in 24/7 real-time
- **Full transparency and traceability** due to integrated MES solution
- **Support for industry-specific audit & compliance conformity** with aerospace, automotive, automation, medical / health care regulations
- **Higher profitability** through reduced manufacturing costs and lower material consumption
- **Positive and lasting effects** on the environment
- **Competitive advantage** due to shortened manufacturing and product delivery cycles

Synoptik Product Suite.

Key Benefits.



Summary:

Synoptik’s advantages.

Comparing of Scenarios

schedule 1

See Details

Select Scenario

Duration

16 days

Start:

11/05/2020 08:00

Finish:

11/21/2020 18:00

Extra Cost:

€531480

Cost:

€531480

schedule 2

See Details

Select Scenario

Duration

16 days

Start:

11/05/2020 08:00

Finish:

11/21/2020 18:00

Extra Cost:

€531480

Cost:

€531480

Cancel Process

Back

TIT-912T591_1

Combining Batches

Main Info

Powder id TIT-912T591_1

Combining Batches In Progress

Future Process:

Container 912S9 (4): 75 kg of Titan (batch TIT-new002, RecNum 2, blend: Y), Container 912V25 (2): 9 kg of Titan (batch TIT-912T511, RecNum 1, blend: N).

Previous Process:

Container 912S9 (4): 45 kg of Titan (batch TIT-912V9, RecNum 2, blend: N), Container 912V25 (2): 39 kg of Titan (batch TIT-912T511, RecNum 1, blend: N).

kg

Weight

0

Assigned Roles

#TIT-912T591_1 Class: A

Specification

TI64AL4V-12+15_6493

Cycle Count

1

Volume

10

Container

912V99

#TIT-912V12_2 Class: A

Specification

TI64AL4V-13+19_6494

Cycle Count

2

Volume

15

Container

912S9

#TIT-912V10_1 Class: A

Specification

TI64AL4V-11+17_6494

Cycle Count

1

Volume

10

Container

912V23

#TIT-912V19_2 Class: A

Specification

TI64AL4V-XXXXX

Cycle Count

2

Volume

35

Container

912V25

Comparing Schedules

Cost	Powder Recycling	Machine Utilization
€531480	00.90	No
€531480	00.90	No

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

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Synoptik Product Suite. Key Benefits.



Summary: Synoptik's advantages.

Software platform solving NP-hard optimization problems

- Utilizes multiple methods for hard-problem optimization
- Takes complexity out of processes
 - Enables real industrialization / automation through intelligent solutions
- Maximizing productivity and quality
 - Resolves varieties of operational issues other systems are incapable of
- Realizing high percentage cost savings
 - Puts production processes also economically at the forefront
- Sustainable production
 - Optimized material consumption, less waste

Synoptik Product Suite. USP.



Market Differentiation.

Order Optimization

schedule 1

Print Jobs (3)

Print Job 980296

05/11/20 09:11 09/11/20 00:11

pist01 valve01

Print Job 980300

05/11/20 09:11 12/11/20 10:11

coolfan01 burn-b01 casassem01

Print Job 980310

05/11/20 09:11 21/11/20 19:11

fluidpower01 pipevalv01

Print jobs details

Print Job 980310

Show timeline Show details

Machine: CL-112 EOS-11

Powder: Ti6Al4v

Container: 912A14 new002 912V31 912V25 912A11 912A13 new001 912S73

CUSTOMER ORDER: fluidpower01 4120001 - 9 pipevalv01 1110001 - 7

Customer Order List

Product Name	Customer Order	Unit Cost per part	Order Size	Customer	Expected Completion Date	Completion Date	Powder Requi
Valve	1110001 - 1	95	500	TermSpeed	03/09/2020	03/09/2020	AlSi10Mg
Pipe Valve	1110001 - 2	32	150	TermSpeed	03/05/2020	03/05/2020	AlSi10Mg
valve01	1110001 - 5	95	500	TermSpeed	03/09/2020	03/09/2020	AlSi10Mg
pipevalv01	1110001 - 7	32	150	TermSpeed	03/05/2020	03/05/2020	AlSi10Mg
Piston	1980008 - 1	32	300	ThinAirCo	03/05/2020	03/05/2020	INC718
pist01	1980008 - 5	32	300	ThinAirCo	03/05/2020	03/05/2020	INC718
Vacuum Trap C...	3120004 - 1	210	50	KaroSymp	03/07/2020	03/07/2020	Ti6Al4v
Vacuum Trap C...	3120005 - 1	205	45	Karosymp	03/11/2020	03/10/2020	Ti6Al4v
Converter	3120005 - 2	19	900	Karosymp	03/11/2020	03/10/2020	AlSi10Mg
Burner A	3120009 - 1	40	300	WW_Race	03/05/2020	03/01/2020	INC718
burn-a01	3120009 - 5	40	300	WW_Race	03/05/2020	03/01/2020	INC718
Burner B	3120010 - 1	45	300	WW_Race	03/11/2020	03/10/2020	Ti6Al4v
burn-b01	3120010 - 5	45	300	WW_Race	03/11/2020	03/10/2020	Ti6Al4v
Cooling Fan	4120001 - 1	110	250	FullWings	ASAP	03/01/2020	Ti6Al4v
Burner B	4120001 - 2	91	200	FullWings	03/29/2020	03/21/2020	Ti6Al4v

Synoptik Product Suite. USP.



Market Differentiation I/II:

- **One-Step Holistic Process Planning (Enables Economics of Scale for AM)**
 - Optimizer optimizes in ,one big step‘
 - Considers any number of variables and rules affecting the entire manufacturing process
 - ,Uniplaner‘: Configurable business cases
 - Planning for material consumption, material re-use and costs
 - Maximizing powder re-cycling
 - Integrated Post-Processing Optimization
 - Calculation of Planned Costs
- **Real-Time Integration of Production Scheduling and MES**
 - Re-active Scheduling: Optimizer continuously adjusts plan in real-time
 - Accurate Cost Calculation
- **AI-based Self-Optimization for Industry 4.0 / IIot (WIP)**
 - SYNOPTIK re-invents itself by learning new rules and correlations between data sets

Synoptik Product Suite. USP.



Market Differentiation II/II:

- **Supports industry-specific Audit & Compliance conformity**
 - Aerospace, Automotive, Automation, Medical
 - Ready-to-use industry templates
- **Flexible adaptation for material management**
 - Configurable for metals, filaments/polyamides, ceramics, bio inks etc....
- **Solution for Additive Manufacturing AND / OR Post-Processing Areas**
 - Supports hybrid use for individual requirements
 - Schedule Optimizer and MES can be used individually as stand-alone functionality in AM or non-AM modalities
 - Easy upgrade to a fully integrated system for best possible results

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How can we support you?

Professional end-to-end process support

- Production support for Additive Manufacturing plus integrated CNC processes
- Multi materials - for metal, polymere, ceramic printing
- Software and technical consulting for integration / implementation out of a single source
- Inhouse knowledge of printing technologies
- Experienced experts for developing interfaces to various systems (e.g. ERP)
- Industry experience in Aerospace, Automation, Automotive, Medical, Health Care, High-tech ...

Value of Strategic Partnership

- Supporting strategical market approach for innovative service offerings
- Partnership for value-added printing solutions
- Contribution to customer's USP features

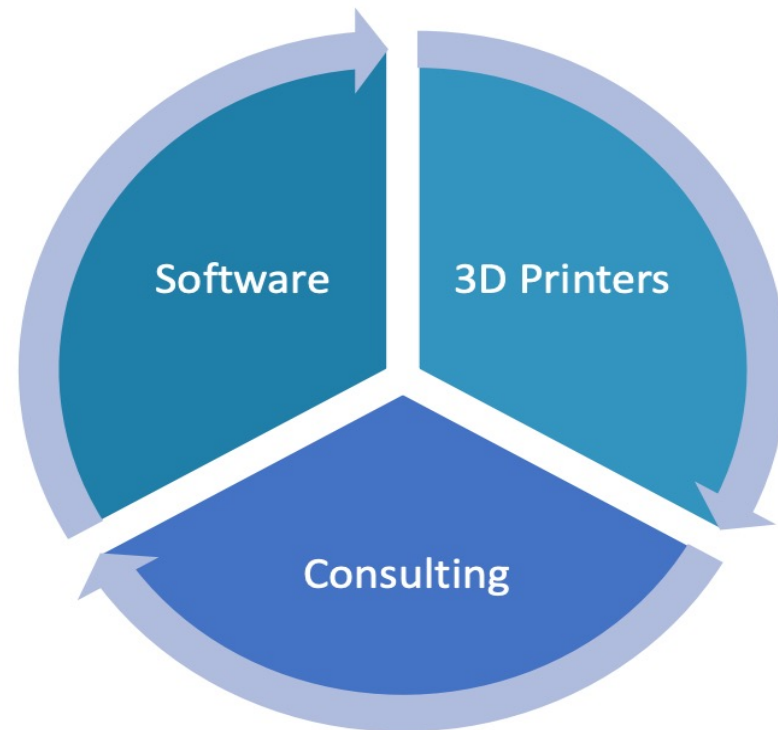
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Example of Industry Package:
360 Aerospace AM Package.

Professional guidance to get Aerospace compliant

- Pre-configured templates considering all necessary compliance regulations / certifications
- Qualification support for manufacturing aerospace grade parts by offering:
 - Synoptik AM Schedule Optimizer
 - Synoptik AM MES
 - Laser printers of different sizes / brands
 - Consulting Services



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Industry Package: 360 Aerospace AM Package.

Software

- Tracking all manufacturing movements
 - Post-processing
 - Process parameters
 - Material properties
- Production and nesting optimization
 - Resource and task scheduling optimization
 - KPI calculations
- Power batch genealogy report
- Document Management
 - All engineering and manufacturing /QI files available and linked to the relevant process
- Storing all manufacturing data and tracked information in a blockchain (WIP)
 - Data can be distributed within the blockchain for analytical and compliance purposes to customers and 3rd party institutions with authorization controls in accordance with GDPR (WIP)

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Industry Package:
360 Aerospace AM Package.

3D Printers and Plug & Play Modular Workshops

- High-precision Laser Beam Melting (LBM) and DED machines
- Mobile production facility that can be installed anywhere without a need for investing into plant real estate
- Large number of configuration options as to number of machines, sieving stations, power feed etc....
- Configurable parameter settings to comply with aerospace requirements

Consulting

- Helping small/medium sized to large enterprises become AMS7000, AMS 7001, AMS 7002, AMS 7003 compliant
- Establishing, implementing and maintaining all process and compliance requirements

Gravity Pull Systems, Inc. & Synoptik



About us.

Gravity Pull Systems, Inc. is the enabler of industrialization in additive manufacturing (AM). Located in Switzerland, the technology solutions provider for manufacturing companies has developed Synoptik, a software solution to optimise Additive Manufacturing for the aerospace, automotive, automation, medical , health care, high-tech industries.

Compared to established software systems with individual single-point functions, Synoptik manages complexity in AM by enabling holistic process planning - a simple solution to highly complex problems. The holistic solution approach enables best-practice applications for industrialised AM processes, from order entry, initial planning to production completion, including post-processing. The integration of the Scheduling Optimizer function with a Manufacturing Execution System (MES) enables dynamic adjustment of changing process parameters in real-time with flexible adjustment of production times. Continuous monitoring via Track & Trace ensures continuous transparency and traceability across the entire manufacturing process and meets industry-specific compliance requirements; while its dynamic adjustment achieves increased profitability, reduces manufacturing costs and has a lasting effect on environmental protection through lower material consumption.

Synoptik is based on highly complex Artificial Intelligence models, its algorithms calculate any changes in procedures, process parameters, material consumption and schedules 24/7 in real-time, incorporate them into production processes and continuously re-calculate production costs.

With decades of experience in its team, Gravity Pull Systems supports manufacturers and 3D print service providers to succeed in industrialization and digital transformation within the expanding field of AM.

Gravity Pull Systems, Inc.



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Company video: <https://www.youtube.com/watch?v=BMtj5zRmWbc&feature=youtu.be>

SYNOPTIK Product video: <https://www.youtube.com/watch?v=i28KvqjcfE&feature=youtu.be>